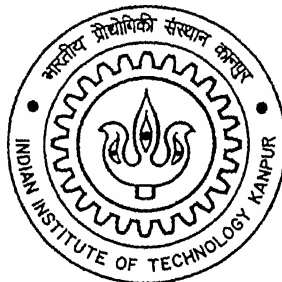


DIFFICULTY IN ALIGNING MANUFACTURING DECISIONS WITH OBJECTIVES IN DYNAMIC ENVIRONMENTS: FRAMEWORK REVISION WITH MORE DATA

A Thesis Submitted
In Partial Fulfillment of the Requirements
For the Degree of
MASTER OF TECHNOLOGY

By
ANSHUMAN BEHERA



to the
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INDIAN INSTITUTE OF TECHNOLOGY KANPUR
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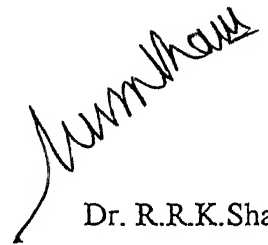
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CERTIFICATE

This is to certify that the work contained in the thesis entitled " *Difficulty In Aligning Manufacturing Decisions With Objectives In Dynamic Environments: framework revision with more data*" has been carried out by Mr. Anshuman Behera (Roll No. 9811405) under my supervision and that this work has not been submitted elsewhere for any degree.



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Abstract

Manufacturing decisions are taken in dynamic environments. However earlier works took a static view of the situations. Reddy (1999) gave a framework, which took into consideration dynamic aspect of manufacturing decisions. However they didn't gave adequate data (only 6 companies) to verify the framework presented. We have analyzed 16 manufacturing organizations and revised the hypothesis on - many occasions. Thus we have enriched the framework proposed by Reddy (1999) our work coupled with Reddy's work offers guidelines to the new manufacturing units regarding various manufacturing decisions. It also gives guidelines to the present manufacturing companies who are not profitable and they can get help from our study.

Acknowledgement

I would like to express my sincere thanks to **Dr. R.R.K.Sharma** for his invaluable guidance and encouragement during the course of this thesis work. I am heartily thankful to him for the confidence he showed in me. I also thank him for the encouragement and motivation provided me through the discussion we had, which helped me enormously.

I take this opportunity to thank and express my gratitude to all the faculty members of the IME department for the support extended to me throughout my stay in the course. I also thank all the office staff members for the co-operation extended to me.

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ANSHUMAN BEHERA

CONTENTS

<u>CHAPTER</u>	<u>CONTENTS</u>	<u>PAGE</u>
Chapter-1	Introduction	1-3
Chapter-2	Literature Review	4-13
Sec.2.1	Definition Of Manufacturing Strategy	4
Sec 2 2	Manufacturing In Corporate Strategy	5-6
Sec 2 3	Strategies for Competing Through Manufacturing	7-9
Sec.2 4	Contents Of Manufacturing Strategy	10-11
Sec.2 5	Literature On Change In Manufacturing Strategy	12-13
Sec.2 6	Risk In Strategic Management Research	13
Chapter-3	Conceptual Framework	14-36
Sec 3.1	Proportions Made For The Static Model	14-24
Sec.3 2	Proportions Made For The Dynamic Model	24-36
Chapter-4	Solution Methodology	37-39
Sec.4.1	Introduction	37
Sec 4 2	Organization Of the Questionnaire	37-38
Sec.4.3	Solution Methodology	38-39
Chapter-5	Analysis Of the Data	40-118
Sec.5.1	Relating Objectives To Manufacturing Decisions	40-41
Sec 5.2 1	LSL	41-46
Sec.5.2.2	EMA INDIA	46-51
Sec.5.2.3	DUNCANS	52-53
Sec.5 2.4	MARUTI UDYOG	54-59
Sec 5.2.5	HERO-HONDA	59-65
Sec.5.2 6	FRONTIER SPRINGS	65-70
Sec.5.2.7	KANPUR WOOLEN	70-75
Sec.5.2.8	INDAL	76-81
Sec.5 2.9	PEPSI-CO	81-86
Sec.5 2.10	EVERADAY	87-91

Sec 5 2 11	IDCOL CEMENTS	91-96
Sec.5 2 12	UPTRON	96-101
Sec.5 2 13	KANPUR PLASTIPACK	101-106
Sec 5 2.14	TRACKPARTS INDIA	106-108
Sec 5 2 15	TENNARY AND FOOTWEAR	108-113
Sec.5.2 16	THERMIT INDIA	113-118
Chapter-6	Results and Discussions	119-121
Chapter-7	Conclusion	122
References		
Appendix-A	Questionnaire	
Appendix-B	List of Companies	

CHAPTER-1

INTRODUCTION

Management, the branch of science which deals with the control and organization of certain activities for a business firm etc managing an organization is a more vital and trivial part than producing a product in it as far as manufacturing organizations are concerned. One of the oldest and the most important branch of management are that of production management and strategic management. But it became a slightly neglected part during the early part of the twentieth century. But now it has been realized that it is a very important part for the corporate and business strategies comprising of well co-ordinate activities and actions meant for a long-term suitable advantage over the competitor.

The process model of manufacturing strategy is a newer concept as compared to the other branches of the management science. A new revolution in this field has been brought by Skinner (1969) in which the manufacturing strategy literature has been developed on the lines of the contents of manufacturing strategy. The conceptual work published in the 70's lead many authors to join in the fray of discovering the importance of manufacturing strategy. It again gained a lot of momentum in the 80's and now became a broad area of research and in our work we have tried to make an attempt to enlist some of the major area of discussion.

The concept of manufacturing strategy can be broadly classified into two categories.

1. Competitive priorities that help in appropriately targeting the manufacturing resources.
2. Decision areas of manufacturing functions that help anyone to set objectives set by the market conditions.

A very important area we have discussed is the issue of 'focus' and 'trade-off'. Skinner stated that manufacturing strategy and the manufacturing decisions have to be designed according to a certain pre-decided set of manufacturing objectives. The organization can't be expected to excel in all the fields. But Skinner had also admitted that once an organization has decided to focus on a particular task or the objectives they would design the manufacturing strategy accordingly and it's really very difficult to re-design the decisions for any change in the objectives. For example, manufacturing decisions in an organization can be designed in the following five ways like on (1) plant and equipment (2) production planning and control (3) labor force and staffing (4) product design and management (5) organization and management. Some more manufacturing aspects can be added to this like (6) organization structure (7) vertical integration (8) vendor relation (9) capacity and technology etc. These decisions are poised according to the manufacturing objectives of the organization. The main objectives of an organization may be like manufacturing cost, delivery performance, volume fluctuation, quality and reliability, innovativeness and introduction of a new product etc. The design of the manufacturing decisions will be different when these decisions are at their lowest priorities as compared to when at the highest level.

In this work titled "Difficulty in Aligning Manufacturing Decisions with Objectives in Dynamic Environments: Framework Revision With more Data", we have tried to deduce the nature of manufacturing decisions to be taken for a particular set of objectives. In our work we have considered mainly three manufacturing objectives (1) product variety (2) delivery performance and (3) volume flexibility. These objectives can be at their highest or lowest level and accordingly Reddy (1999) has developed eight static cases. For each of the particular objectives the organization has to take certain manufacturing decisions. For any change in the manufacturing objectives the organization has to change their decisions as a part of the re-structuring of the corporate strategy. In a highly competitive and dynamic environment a company has always to re-access its priorities. In this context of the changed scenario it is very important to de-focus and make changes and design the manufacturing strategy accordingly.

Here Reddy (1999) has developed a conceptual framework for change in the manufacturing objectives and developed 28 dynamic cases by taking different permutations from the static cases and maximum possible attempt has been done to validate these cases. In this work we have verified the hypothesis developed by Reddy (1999) and modified them on - occasions to develop a new set of hypothesis. In chapter 2 we have presented a review of the relevant literature related to this area. In chapter 3 we give the conceptual framework developed by Reddy (1999). In the chapter 4 we have given the methodology adopted for verifying this framework. Chapter 5 gives the analysis of the data that I have collected and discussion of the results and modified set of hypothesis. In chapter 6 we have given the results and discussions and the last chapter i.e. chapter 7 the final conclusion has been given and that is being discussed and further scope of research has been discussed. The questionnaire, list of the companies and the data has been given in the appendix.

CHAPTER-2

LITERATURE REVIEW

The literature on manufacturing strategy revolves around some important field like manufacturing strategy, manufacturing corporate strategy, taxonomy of manufacturing strategies, relationship of corporate management with the manufacturing strategy and importance of the objectives like product variety, delivery performance and volume flexibility in making manufacturing decisions. We had also done some literature survey on strategic management research. In some of the recent publications Skinner's work and his theory has been questioned. Now new kind of concepts is arising in the field of manufacturing strategy like "lean manufacturing" and "advanced manufacturing" are arising. These have questioned the issue of "trade off" and "focus". Others have also argued that with the issue of focus on quality the issue of trade off will always remain there.

2.1 Definition of Manufacturing Strategy: -

A broad definition of manufacturing strategy can be given as follows. -

"Manufacturing strategy can be defined as the theory that provides a vision for the manufacturing organization based on its business strategy. It consists of the objectives and the strategies of the program, which helps the business to gain, maintain, or to take a competitive advantage". Two important things in this definition should be highlighted; one is that manufacturing strategy is more than just a plan for the organization and the second one is that manufacturing should contain long range objectives as well as strategies and programs for the manufacturing.

The manufacturing strategy of an organization is also closely related with the business and the functional strategies. This can be explained as business strategy being the first phase of manufacturing strategy process and by involving different functional people it can be easily achieved.

2.2 Manufacturing In Corporate Strategy: -

The work by Skinner gives a good concept about the manufacturing in the corporate strategy. In his work of "Manufacturing-missing link in the corporate strategy", he introduced the concept of manufacturing in the corporate strategy. In his work he had stated that the manufacturing system is always designed for a purpose and focus and attention is paid to a task which will create clear strategic advantage. All the elements should be designed for that task and they must fit together for that purpose. The proper design of the manufacturing system is a vital task as for a poor design no patching can make the system to work. There should be proper effectiveness as it is the only way to reach the goals.

Many studies have been focused on the corporate entrepreneurship. One of the works by Schumpeter (1883-1950) argues that the main agents for the growth of an organization are those entrepreneurs who introduce new products, new methods of production to meet the delivery date and introduce other innovations in the activities. He believed that innovations typically represent the improvement in terms of the product or the process utility and as a result create greater buyer interest and overall economic activity. One of the major themes that emerged is the firm level of the entrepreneurial intensity is effected by both the internal and the external corporate context (Zahara 1991). Firms in the turbulent vs. stable environments are more innovative, risk taking and proactive. There are mainly five dimensions of the strategic management for the corporate entrepreneurship. Those dimensions are (1) scanning intensity (2) planning flexibility (3) planning horizon (4) locus of planning and (5) control attributes. All these dimensions are explained as below: -

2.2.1 *Scanning intensity* refers to the managerial activity of learning about events and the trends in the environments. It provides managers the trend and the events in the relevant environments and provides opportunity recognition. It also helps the managers to reduce the uncertainty. As a means of partial uncertainty absorption it will lower the risk in the venture and will make sure that the company will engage in that venture. So it proves that a positive relationship exists between the scanning intensity and the corporate entrepreneurship.

2.2.2 Planning flexibility is the capacity of the firm's strategic plan to change as environmental opportunities. Flexible planning will allow the plant to manage with the changes. But as per Newman (1951) once a manager makes a plan he will try to make it happen at any cost. Also the more clearly it is articulated the more will be the resistance for the plan. Also for a conservative firm planning will not be very effective. Despite of all these constraints planning still gives a mode for the organization for meeting the environmental change.

2.2.3 Planning horizon is the length of the time for which the decision-makers consider in planning. This can vary from less than one year to more than 15 years depending on the type of the firm. For those firms, which compete in turbulent environments, having a short product life cycle will have a short period of planning horizon as that in a static environment. So a negative relationship exists between the planning horizon and the corporate entrepreneurship.

2.2.4 Locus of planning is the employees' involvement in the planning procedure. A deep locus means a high involvement of the employees in the decision making. It will bring employees closest to the customers. Also it will increase in the diversity of the viewpoints for making a strategic plan. So a positive relationship is there between deep locus of planning with the corporate entrepreneurship.

2.2.5 Control attributes will make sure that the firm makes its objectives and goals. There are two kind of control like the strategic control and financial control. The former is necessary for a competitive organization and has a positive relationship with the corporate strategy and financial control is for the conservative firms.

Skinner (1969) stated that the most important factor for the survival of a firm is the management of the manufacturing. A manufacturing system is a very expensive entity and risky in size, capital and location. It requires trained workers and managers for a proper operation. Again it requires correct quality, cost and time. Again it has to compete in a turbulent and dynamic environments. So it became very difficult for a costly and risky entity to change very fast with the demand of the market.

2.3 Strategies for Competing through Manufacturing: -

For a manufacturing organization to survive it relies on the different kind of strategies like marketing, finance, personal and manufacturing. All these functional strategies are a part of corporate strategy. But the manufacturing strategy as a competitive weapon goes back to Miller and Roger (1956), but they really didn't differentiate between business and manufacturing strategy. Skinner (1978) gave the notation of the manufacturing as separate to the business strategy. There are two elements that define manufacturing as a part of the functional strategy. These elements are:

1. The first element is "what manufacturing function may accomplish", which is defined as the capability of the manufacturing firm must have to compete with the overall business and the marketing strategy. The list includes cost, efficiency, delivery performance and flexibility. Hill (1989) has linked the manufacturing task to the customer needs by defining the task in terms of those capabilities that are critical to win the customers.
2. The second element is pattern of manufacturing choice that a company makes (Hays and Wheelwright 1984). These are classified into two types, one is the structural like the decisions on facilities, technologies, vertical integration and capacity. The second is on the manufacturing infrastructure like quality management, organization, workforce policies etc.

Though these basic elements are accepted but the question remains is that how to operationalize them and the nature of the connection between the task and the choices. Hatten Et al (1978) had stated that "in general these models deal with the existing operations and are not strategic in outlook i.e. they are not concerned with the changing of the existing operations nor do they take global encompassing views on it. So the main concern remains is the role of the manufacturing and its role in the firm's competitive position. What traditionally has been considered as routine, low level decisions often had important, unrecognized and unexplored strategic consequences

The concept of manufacturing strategy gives a very different kind of organization where decisions on manufacturing play a very important role in business.

These decisions have a critical role for competing for the organization. This framework is based on six dimensions -

- There are many ways to compete.
- Firms can't be all things to all people.
- There are many trade-offs in manufacturing decisions on structure and infrastructure.
- Manufacturing strategy is defined by the pattern of decisions of various structure and infrastructure.
- A manufacturing strategy success is determined by the coherence of the pattern of decisions across many decision categories, and by the match between strategy, other functions and the overall business.
- Over the longer term a manufacturing strategy succeeds as it guides the business in building capabilities essential to achieve the firm's chosen competitive advantage.

Basically these six propositions establish the necessity of the choice in manufacturing, characterize the nature of choice the firm confronts and define the criteria to judge the quality.

For the survival of a firm in fast changing industries one of the major fields of research is the firm's capability to make up with the technological changes. A separate branch of research has focused on the manager's ability to change firm's competitive and technological strategies to survive (Willard and Cooper 1985). While some of these statements are contradicting to each other studies have now emerged how to meet the technological, cultural, managerial and competitive forces can interact to affect the firm's probability of survival. Variables related to the managerial choice rather than the factors in the outside environment that are beyond the control of the managers were the primary factor for the survival of the firm. There are two insights to this theory. The first is the emergence of a new product design makes a significant watershed in the competitive industry. Here there emerges a 'window of learning' or 'window of opportunity' just before emergence of a new design when entry will be advantageous. The second is the risk of betting on new technologies vs. risk on betting new markets. The survival will be more easy for those which has entered the market much before than those which enter with a new product.

2.4 Contents of manufacturing strategy: -

Manufacturing function is technical in nature and hence research has stated the contents that the top manager should consider while taking the manufacturing decisions. A lot of work has been done to guide the top management to choose an appropriate set of priorities to while planning for the manufacturing function. The main functional areas can be classified as. -

- ❖ Decisions areas of long term importance in the manufacturing functions.
- ❖ Competitive priorities that help in properly targeting the manufacturing resources

The main manufacturing objectives on which the top management used to concentrate is (1) product variety (2) delivery performance and (3) volume flexibility.

Some of the literature survey has been done to find out the importance of all these manufacturing objectives.

Today Company can't gain profit by continuing with the same standardized product producing in high volume of a standardized product. Today customers need is changing continuously and to meet this need companies are changing their product to take advantage over their competitor. The main difference between the Japanese and the American companies is with their strategy over the product variety. The US used to produce in high volume of the same product while the Japanese do it with a variety of products. So the Japanese have the advantage of meeting customer need in a better way. The product variety forces a manufacturing firm to confront a fundamental tradeoff: - the increased revenue due to the variety vs. the increase in the cost due to the loss of scale economies. So based on this the firm may follow either low variety or a focused plant or a very high variety. There has been a lot of disagreement over which one to follow. Skinner (1974) stated that a firm should focus on the manufacturing function to outperform the competitor. But Wayne (1974) stated that choosing a focused strategy might restrict the firm to use specialized workforce and reduce the ability to change the product. The product variety has both its advantage and the disadvantages. The benefits may include the cost of additional complexity is justified when customer gets the features he wants. So the product variety is good when it adds market value at the shake of little cost, while it is bad if it offers no value to the customers. Again some of the

disadvantages are like it may decrease the productivity by increasing the setup cost due to the change in the product. With the increase in the complexity the quality also may suffer, as the worker has to handle different kind of job. Also balancing of the line may suffer and also it will effect the performance of the indirect workers

But in any case if a plant can minimize the cost of product variety it will have more flexibility in choosing how much variety to offer to the market. Technology is not the only thing, which can reduce the cost of product variety. We except a lean production organization should have advantage over the mass production system. The benefit of the JIT kind of system is ability to deliver parts to the assembly line in sequence reducing inside stock of the inventory of all possible combination. Also work teams, job rotation and training for multi-skilling will increase with dealing with product variety. Continuous improvement of the team members will also help achieving a smooth production flow thus reducing the cost. Long term contracts with the small number of suppliers will reduce the co-ordination cost of dealing with the higher number of parts associated with the high product variety. Finally degree of lean product development yields more manufacturable designs with fewer parts; greater modularity and standardized interface for easier connection- product variety will have lesser impact on the assembly plants.

Delivery performance is also a major objective that a plant should meet with. Now in a competitive market the customer preference is not only over price and quality but also with the delivery speed. For the success the main requirements are of high quality, low cost, introducing new product and moving it in time is the secret of success of an organization. Recent studies have shown that response time has become an important strategic weapon for the global competition. Customers now a day assess reliability and responsiveness as the two main attributes for the service for many of the industries. The fast and reliable delivery increase the market share, increase the price premium, lower the cost and make the customer happy. According to Hotelling (1929) customers have different preferences and ones choice will not affect the other customers till it is concerned with the price and the quantity, but it will be affected when the matter comes over delivery time. In the time competition the choice of the customers will influence the transition of the state of the world, which will effect the choice of the other

customers who will arrive later. So these things shows the importance of the delivery performance in a competitive world.

It is also argued that to be successful the market will need a specific ordering of the priorities and around that respective manufacturing facilities are built. This lead Skinner (1978) to come up with the concept of plant within plant, which means the segmentation of the production facilities to cater all the market segment. Each of these segments will be able to develop its unique culture that is suitable to give high performance for that particular market segment. Other notable contributions are the plant and equipment strategy and the personnel strategy.

The list also includes the other manufacturing decision factors like the organization structure, vertical integration, vendor relation etc. The structure of an organization and the decisions making are complementary to ensure a good performance. Task forces and coordination committees can encourage rationality in decision making. Formalization in an organization leads it to the use of formal procedures and job descriptions, cost and quality control, specialists and technocrats increase systematic and rational mode of decision making.

Centralization discourages rationality by placing most of the onus of decision making in the hand of the top executives. It may feel the top management to be assertive, venturesome and proactive as they have more power to commit significant resource for a project. Standardization will encourage the people to use the standardized procedure in the organization. This will discourage the workers to use any innovative ideas, as they have to follow only the standardized procedures. So it will increase the repetitiveness of the job.

Firms having an uncertain external environment or a lot of complexity in the environment will have low vertical integration. But those, which have low complexity in their environment, will have a very high vertical integration. Those having a low vertical integration will be more dependent on the vendor. Hence vendors will have more bargaining power in these kind of organization. But those having high relationship with the vendor will have a competitive relationship with the vendor.

2.5 Literature On The Change In Manufacturing Strategy: -

Attention will also be given for any change in the manufacturing strategy of an organization. For surviving in a competitive world a manufacturing organization will have to always change their manufacturing according to the need of the market. Historical keys to success inevitably became barriers to improved competitiveness. Customer needs, competitors, technologies, regulations and many other conditions do change and will result a competitive opportunity.

Lawrence A Benningson (1996) stated that for bringing change in the manufacturing strategy will not require evolutionary but revolutionary ideas. Continuous improvement is a prerequisite of success for a competitive environment. To successfully re-deploy manufacturing resources, management must accomplish change in several dimensions usually under time pressure. These dimensions are noted as follows:

1. mind set- what people believe about:-

- Customer needs.
- Competitive standards.
- What manufacturing policies/processes are thinkable.
- How manufacturing should work.

2. strategy- how resources are deployed for:-

- ✓ Hard technology, capacity, vertical integration, regional position.
- ✓ Soft skills, values, organization capabilities.
- ✓ Creating, making and buying products and services.

3. actions- what people do from day to day:-

- ◆ Identifying priorities and solving problems in manufacturing.
- ◆ Working relationship with manufacturing.
- ◆ Working relationship with manufacturing and other functions.

According to Benningsons (1996) no company can realize the benefits of changing a manufacturing strategy unless it tackles these issues in an integrated fashion.

The element that forces the changes is - A healthy market analysis, problem solving and design activities, attention to the step by step understanding etc.

2.6 Risk In Strategic Management Research: -

Risk is an essential element of strategic management and figures in many studies of industries, firm and business industry performance. Recent developments in financial economics and management science added the urgency to search for the measures for the risk indigenous to strategy. This draw attention to the growing list of logical deficiencies that weaken the validity of traditional conceptualization of risk employed by the researchers. The concept of validity, rigor and generalizability of standard treatments also serve to undermine the strength of our managerial prescriptions. Strategic researchers are more concerned with the relationship among the risk, superior level of performance, managers and organization. They are mostly concerned with the managers decisions process and their effort to create above average returns for the firms. As Baird and Thomas (1990) noted we lack a generally accepted model of strategic risk taking which recognizes the conceptual interplay among the decision makers, organizational process and market and industry factors that influence the strategic risk taking. As a whole the strategic management research has been dominated by a few easy to calculate, borrowed measure of risk

In this case manufacturing corporate strategy gives the framework and procedure for achieving this kind of changes. But no author till date deals with the way how to change their manufacturing decisions on plant and equipment, production planning and control, labor skills, organization structure, vertical integration and vendor relation for meeting the change in the objectives related to the product variety, delivery performance and volume flexibility. This work is an attempt to fill up this gap and gives a comprehensive framework to deal with the change in the objectives and how to change the decisions to make these objectives.

CHAPTER-3

CONCEPTUAL FRAMEWORK

3.1 RELATING MANUFACTURING OBJECTIVES AND DECISIONS IN STATIC CASE

3.1.1 Case S1

Product Variety – Low, Delivery Performance – Low, Volume Flexibility – Low.

Plant and Equipment: As product variety is low the firm will have a large number of special purpose machines. Also the firm may go for one big plant, with high capacity to reap the benefits of economies of scale. As product variety and delivery performance is low and plant may be located near the materials as against the alternative of locating near the market. They will use very specialized tooling and they will be permanent in nature.

PPC: As product variety is low and delivery performance is also low strong scheduling policies will not be in use. Controls will be designed to minimize labor cost and maximize material usage. We deduce that this group will not have high level of importance in the organization.

Labor Skills: Due to the presence of special purpose machines the workers will not be highly skilled. They will not have the capability of performing different kinds of jobs and handling a variety of machines. Hence we say that the worker skill level will be low.

Organization Structure: Here we have considered four aspects of organization structure. They are specialization, standardization, formalization, centralization and complexity of workflow.

Specialization: Specialization may be low as due to low product variety the need for existence of a large number of separate positions for any duty say storekeeping, or maintenance may not arise. Hence the scope for distribution of official duties among a number of positions does not arise. Hence we deduce that specialization would be low.

Standardization: Due to low product variety the use of standard procedures will be high. Hence we deduce that standardization will be high.

Formalization: Due to low product variety there will not be much interaction among the various functional units of the manufacturing department. Also as the procedures used

will be highly standardized there is scope for proper documentation of all the rules, procedures, instructions, and communications. Hence, we deduce that formalization will be high

Centralization: Due to low delivery performance and low volume flexibility and scope for lower level workers and supervisors to take important decisions is low. Hence the delegation of authority will be low. Top level management will take most of the decisions. Hence we say that centralization will be high.

Complexity of workflow: As product variety is low the interdepartmental interaction say (R&D and Design) and other departments will be low. Also use of liaison personnel for coordinating the decisions of various functional units of the manufacturing department will be low. Hence, we deduce that the complexity of workflow will be low.

Vertical integration's product variety is low and volume flexibility is low the dependence of the firm on vendors will be low. They will go for in-house development of the parts to be produced. Hence vertical integration will be high.

Vendor relations. As vertical integration is high the dependence of the firm on vendors will be low. Hence the bargaining power of the vendors will be low. Hence, we deduce that the firm will go for a cooperative relationship with their vendors.

3.12Case S2

Product Variety – Low, Delivery Performance – Low, Volume Flexibility – High

Plant and Equipment: Since volume flexibility is high, they will go for flow lines. Also excess buffer capacities are essential. As product variety is low they will have special purpose machines

PPC: As product variety is low and delivery performance is low strong scheduling policies will not be in use. We deduce that this group will not be having much importance in this organization.

Labor As product variety is low and there exist predominantly special purpose machines, as workers will not possess multiple skills. Also they may not be capable of handling different machines and performing different kinds of jobs.

Organization Structure

Specialization: May be low, as due to low product variety the scope for distribution of official duties among a number of positions will be low.

Standardization: Due to low product variety the use of standard procedures will be high. Hence, we deduce that standardization will be high.

Formalization: Due to the use of standard procedures and little interaction among the various functional units of the manufacturing department, it may be possible to document all the procedures, instructions and communications. Hence, we deduce that formalization will be high.

Centralization: In this case the firm competes on its ability to respond to volume fluctuations quickly, i.e., volume flexibility is high. It responds to volume fluctuations by re-organizing its flow-line. Hence a lot of decisions may be taken at the lower level in the organization. Hence there will be delegation of authority. Hence, we deduce that centralization would be low.

Complexity of workflow: It may be high due to the frequent decisions made due to the volume fluctuations regarding re-organizing the flow-lines.

Vertical Integration: Due to volume fluctuations they may depend on vendors for certain parts. Bought out components to respond quickly to volume fluctuations may be necessitated. Hence, we deduce that vertical integration would be low.

Vendor relations: Due to volume fluctuations dependency on vendors is high. Hence the bargaining power of vendors increases. They would go for a competitive relation with their vendors.

3.13 Case S3

Product Variety – High, Delivery Performance – Low, Volume Flexibility – Low

Plant and Equipment: Since product variety is high the firm will have general-purpose machinery. As delivery performance and volume flexibility is low they may not have flowlines and large buffer inventories.

PPC: Due to high product variety controls will now be designed for reducing the number of set-ups and the set-up times. Scheduling policies will be in use, but as delivery

performance is low activities such as order date promising and meeting due dates would be not be emphasized. This group plays an important role in the organization

Labor Now the workers will be dealing with general-purpose machines Hence they will be high skilled. Also they may possess multiple skills capable of handling different machines and performing different kinds of jobs

Organization Structure

Specialization: Due to product variety there may be a number of positions in a functional unit of the manufacturing department. For example, it may be possible to have storekeepers who are specialized by product or process in the organization. Hence the scope for the distribution of official duties among a number of positions may be possible Also if the firm is having a PWP (Plant within Plant) manufacturing system they the scope for having official duties specialized by product increases. In this case specialization would be high. We deduce that specialization will be high

Standardization: Due to product variety it may not be possible to use standard procedures. Hence, we deduce that standardization will be low However, if the firm were going for a PWP (Plant within Plant) manufacturing system they standardization would be high.

Formalization: Due to product variety the interaction among the functional units of the manufacturing department will be high. New product introductions necessitate a lot of interaction between the R&D and design departments. Hence, it may not be possible to document all the communications and instructions arising in this case Hence, we say that formalization will be low.

Centralization: Centralization will be low as due to high product variety all the various decisions may not be taken at the top level in the organization. Many decisions regarding the enabling of fast product changeovers, reducing set-up times, reducing the number of setups have to be taken at the lower level of management. If the firm has a PWP (Plant within Plant) kind of manufacturing system they a lot of power would be thrust on the plant managers leading delegation of authority to a large extent. Hence, we deduce that centralization would be low.

Complexity of Workflow: Due to the interaction between the various functional units it would be high.

Vertical Integration: Since product variety is high in-house development of all the different parts may not be possible. Hence there will be bought out items. We deduce that vertical integration will be low.

Vendor Relations: As delivery performance is low, the speed of the deliveries from the vendors may not be very important. Importance will be given to the cost and quality of the parts produced by the vendors. Hence they may follow a strategy of having multiple vendors for a single part. We deduce that they may go for a competitive relationship with their vendors.

3.14 Case S4

Product Variety – High, Delivery Performance – Low, Volume Flexibility – High

Plant and Equipment: Due to high product variety they will have general-purpose machines. As delivery performance is low they may not maintain buffer stocks and inventories. As volume flexibility is high they may have to organize their machines as flow-lines.

PPC Due to high product variety issues such as reducing setup times, reducing the number of setups determining the optimal lot size will be of importance. Now scheduling will be an important activity. The group will have an important role to play in the organization.

Labor: The workers will be dealing with general-purpose machines. They will be skilled and capable of handling a variety of machines and performing different kinds of jobs.

Organization Structure:

Specialization: Due to high product variety specialization will be high. Also if the firm has a PWP (Plant within Plant) manufacturing system the scope for having official duties specialized by product increases leading to high specialization.

Standardization: It may not be possible to have standard procedures due to high product variety. We deduce that standardization will be low. However, if PWP (Plant within Plant) is in place they due to higher focus the use of standard procedures may be possible. In this case standardization would be high.

Centralization: Due to volume flexibility decisions regarding reorganizing the flowlines have to be taken at the lower level. Also if PWP (Plant within Plant) is in place then a lot of power is thrust on the plant managers, leading to delegation of authority. In this case centralization would be low. We deduce that centralization will be low.

Formalization: Due to product variety there will be lot of interaction between the various functional units of the manufacturing department. It may not be possible to document all the communications in this case. We deduce that formalization will be low.

Complexity of workflow: Due to product variety interaction between the functional units of the manufacturing department will be high. Hence we deduce that complexity will be high.

Vertical integration: Due to high product variety manufacturing of all the parts in-house may not be possible. They may have to depend on vendors for certain parts. We deduce that vertical integration will be low.

Vendor Relations. They will go for a competitive relationship with their vendors.

3.15 Case S5

Product Variety – Low, Delivery Performance – high, Volume Flexibility – Low

Plant and Equipment: Since product variety is low, they will have special purpose machines. As delivery performance is high they would have arrangements for buffer inventories to ensure uninterrupted production flow.

PPC: As product variety is low scheduling will not be an important activity. Controls for minimizing machine downtime and inventory policies will be in use. This group will have a moderately important role to play in the organization.

Labor Skills: As product variety is low, the workers will be dealing with special purpose machines. Hence they will be trained specifically for handling a particular machine. They will not be capable of handling a variety of machines and performing different kinds of machines. We deduce that they workers will not possess multiple skills and hence their skill level will be low.

Organization Structure:

Specialization: As explained in the earlier cases low product variety manufacturing settings will tend to have low specialization.

Standardization: As product variety is low the use of standard procedures will be rampant. We deduce that standardization will be high.

Centralization: Due to high delivery performance some decisions may be taken at the lower level workforce to meet the contingency conditions. Hence delegation of authority may prevail to a moderate extent. We deduce that centralization will be moderate in this case.

Complexity of workflow: As product variety is low the interdepartmental interaction will be low. Use of liaison personnel or temporary bodies to coordinate the activities of different functional groups will also not be demanded. We deduce that complexity will be low.

Formalization: As explained above due to low complexity it may be possible to document all the procedures and communications. We deduce that formalization will be high.

Vertical integration: As product variety is low in-house development will be high. Also high delivery performance would mean that in-house production is advantageous due to greater control of their operations. The task of coordinating with their vendors would be eliminated. We deduce that vertical integration will be high.

Vendor Relations: Low dependency on vendors would mean that the bargaining power of the vendors would be low. The firm would go for a cooperative relationship with their vendors.

3.16 Case S6

Product Variety – Low, Delivery Performance – High, Volume Flexibility – High

Plant and Equipment: Since delivery performance is high they will have buffer inventories to ensure smooth, uninterrupted production flow. As product variety is low they will have mostly special purpose machines. However, as volume flexibility is high they may invest in machines having excess capacities.

PPC: Scheduling will not be an important activity. High delivery performance would mean that issues such as minimizing machine downtime and maintaining safety stocks would be of importance. We deduce that this group will be of moderate importance in the organization.

Labor Skills. The workers will not be highly skilled. They will not possess the capability of handling different machines and performing different kinds of jobs.

Organization Structure:

Specialization: It will be low due to low product variety.

Standardization: As product variety is low the use of standard procedures in this organization may be high. We deduce that standardization will be high.

Formalization: As product flexibility is low the interdepartmental interaction will be low. Hence, it may be possible to document all the procedures and communications in this case. We deduce that formalization will be high.

Centralization: Decisions regarding use of the excess capacities in cases where quick response to volume fluctuations is necessary have to be taken at the lower level. We deduce that centralization will be low.

Complexity of workflow: As product flexibility, the interdepartmental interaction is low. Hence complexity will be low.

Vertical Integration: As product variety is low there will be in-house production of the parts. Due to volume flexibility they may have to rely on vendors in certain cases. Hence vertical integration will be moderate.

Vendor Relations: Due to delivery performance being high they will tend to go for a cooperative relationship with their vendors.

3.17Case S7

Product Variety – High, Delivery Performance – High, Volume Flexibility – Low

Plant and Equipment: Due to high product variety the firm will be having general-purpose machines. As volume flexibility is low they will not have multiple flow-lines. As delivery is a competing factor, they may invest in automation to enable easier product changeovers. They may go for an FMS setup. Also they may use computers to integrate all the operations right from order receipt, through design and production, to product shipment. Essentially they may implement CIM techniques to assist, augment and automate all the operations.

Labor As the workers deal with general-purpose machines they will be highly skilled. They may also possess multiple skills i.e., they may be capable of handling multiple machines and perform different jobs.

PPC High product variety coupled with high delivery performance would necessitate the use of very efficient scheduling policies. Now issues such as reducing set-up times, the number of set-ups determining the optimal lot sizes will be of prime importance. This group will have an important role to play in the organization.

Organization Structure

Specialization: Distribution of official duties among a number of different positions is possible. If PWP (Plant within Plant) were in place then the scope for having official duties specialized by product increases, in which case specialization would be high. We deduce that specialization will be high.

Standardization: The use of standard procedures may not be possible due to high product variety. Hence we deduce that standardization will be low. However, if PWP (Plant within Plant) is in place then due to higher focus the use of standard procedures may be high. In this case standardization would be high.

Formalization: Due to product variety the interaction between the various functional units of the manufacturing department will be high. Hence it may not be possible to document all the procedures, communications and instructions. Hence formalization would be low.

Centralization: A lot of decisions have to be taken at the lower level especially at the shop-floor level in light of high product variety and high delivery performance. Hence centralization would be low. Also if the firm has a PWP (Plant within Plant) manufacturing system then a lot of power is thrust upon the plant managers. This would lead to delegation of authority to a great extent. Hence centralization would be low.

Complexity of workflow: Due to product variety the interaction between the various functional units of the manufacturing department will be high. Hence complexity would tend to be high.

Vertical Integration. Due to high product variety it may not be possible to produce all parts in-house. But high delivery performance would necessitate timely deliveries from the vendors. Hence they would go for a JIT purchasing strategy. They would develop

long-term stable relations with their vendors. Issues such as proximity of the vendors is important vertical integration would be low.

Vendor Relations: They would go for a JIT purchasing strategy. Hence they would have a cooperative relationship with their vendors.

3.18 Case S8

Product Variety – High, Delivery Performance – High, Volume Flexibility – High

Plant and equipment Due to high product variety they will have general-purpose machines. They may go for an FMS set-up to enable flexible product changeovers.

PPC Scheduling will be a very important activity. Issues such as reducing setup times, reducing the number of set-ups will be important. This group will play an important role in the organization.

Labor: The workforce will be highly skilled. They may possess multiple skills, capable of handling different machines and performing different kinds of jobs.

Organization Structure:

Specialization: Due to high product variety the scope for distribution of official duties among a number of positions is high. Also if PWP (Plant within Plant) is in place then the scope of having official duties specialized by product is high. Hence specialization would be high.

Standardization: Due to high product variety the use of standard procedures may not be possible. Hence standardization will be low. However, if PWP (Plant within Plant) is in place then due to higher focus the use of standard procedures will be high. In this case standardization would be high.

Formalization: Due to product variety the interaction among the various functional units of the manufacturing department will be high. It may not be possible to document all the communications in this case. Hence we deduce that formalization would be low.

Centralization: Due to high delivery performance and high volume flexibility a lot of decisions may have to be taken at the lower level workforce. Also if PWP (Plant within Plant) is in place then a lot of power is thrust upon the plant managers. Hence there will be considerable delegation of authority. Hence centralization would be low.

Complexity of workflow: Due to high interaction among the various functional units due to product flexibility complexity of workflow will be high

Vertical Integration High product variety and volume flexibility would mean high dependence on vendors. But as delivery is also a competing factor they would go for a JIT purchasing strategy. They would develop long-term stable relations with their vendors.

Vendor Relations They would go for a cooperative relationship with their vendors.

3.2 CHANGES INVOLVED IN MANUFACTURING DECISIONS IN DYNAMIC CASES

In static cases the manufacturing decisions are taken to lead to full achievement of manufacturing objectives. When objectives of the manufacturing department themselves change, one has to change the manufacturing decisions once again to achieve maximum effectiveness. Twenty-eight change cases were identified when manufacturing objectives change on one or more of the dimensions of product variety, delivery and volume flexibility. The analysis of changes in manufacturing decisions appears in appendix. The manufacturing decisions on plant and equipment, labor and vertical integration are termed as hard decisions whereas those on PPC, organization structure and vendor relations are called soft decisions.

We thus see that out of twenty-eight dynamic cases in eight cases transition is easy to achieve, in five cases transition is moderately difficult to achieve and in fifteen cases transition is very difficult to achieve.

We argue that when changes in manufacturing decisions are difficult to achieve, the changes would be resisted and in such cases the manufacturing strategy will drive the corporate strategy; and when changes are easier to achieve, the corporate strategy will drive the manufacturing strategy (as has been the conventional wisdom). Before investing in manufacturing resources management must carefully analyse any future changes required in manufacturing divisions objectives. If a difficult change path is seen then management must resort to appropriate pricing policies to recover investments quickly or else avoid investments in such risky environments.

Changes Easy to Achieve

CASE D-1

Product Variety – Low, Delivery Performance – Low, Volume Flexibility – Low → Product Variety – Low, Delivery Performance – High, Volume Flexibility – Low.

The transition is from objectives under S1 to objectives under S5.

TABLE OF CHANGES

Plant and equipment	No major changes required Changes are easy to achieve
Labor	No major changes required Changes are easy to achieve
PPC	Restructuring of group required
Organization Structure	Centralization High → Low No changes required in the other dimensions of organization structure
Vertical Integration	Continues to be high
Vendor Relations	Continue to have a cooperative relationship

CATEGORIZATION

No major changes are required in both hard and soft decisions. Hence this transition will be easy to achieve

CASE D-2

Product Variety – Low, Delivery Performance – Low, Volume Flexibility – High → Product Variety – Low, Delivery Performance – High, Volume Flexibility – Low.

The transition is from objectives under S2 to objectives under S5.

TABLE OF CHANGES

Plant and equipment	No major changes required. Changes are easy to achieve
PPC	Restructuring of the group will not be required.
Labor	No major changes required Changes are easy to achieve
Organization Structure	No changes are required.
Vertical integration	Moderate → Low
Vender relations	Competitive → cooperative

CATEGORIZATION

In this transition no changes are required in the soft decisions Changes in the hard decisions are easy to achieve This transition will be easy to achieve

3.23CASE D-3

Product Variety – Low, Delivery Performance – Low, Volume Flexibility – High → Product Variety – Low, Delivery Performance – High, Volume Flexibility – High.

The transition is from objectives under S2 to objectives under S6.

TABLE OF CHANGES

Plant and equipment	No major changes required. Change is easy to achieve.
PPC	Restructuring of the group is not essential.
Labor	No major changes required Change is easy to achieve.
Organization structure	No changes required
Vertical integration	No change
Vendor relations	Will adopt JIT purchasing strategy.

CATEGORIZATION

No changes are required in the soft decisions No major changes are required in the hard decisions This transition will be easy to achieve

CASE D-4

Product Variety – High, Delivery Performance – Low, Volume Flexibility – Low → Product Variety – High, Delivery Performance – Low, Volume Flexibility – High.

The transition is from objectives under S3 to objectives under S4.

TABLE OF CHANGES

Plant and equipment	No major changes required Change is easy to achieve
PPC	Restructuring of the group is not required
Labor	No major changes required
Organization structure	No changes in any dimension of organization structure
Vertical integration	No change.
Vendor relations	No change

CATEGORIZATION

In this transition no changes in soft and hard decisions are required
This transition is easy to achieve.

CASE D-5

Product Variety – High, Delivery Performance – Low, Volume Flexibility – Low → Product Variety – High, Delivery Performance – High, Volume Flexibility – Low.

The transition is from objectives under S3 to objectives under S7.

TABLE OF CHANGES

Plant and equipment	No major changes required Change is easy to achieve
PPC	Restructuring not required. Change easy to achieve
Labor	No change required.
Organization structure	No change required
Vertical integration	No change
Vendor relations	Competitive relationship → JIT purchasing strategy

CATEGORIZATION

In this transition the changes involved in the hard decisions are of moderate difficulty No major changes are required in the soft decisions. This transition is easy to achieve

CASE D-6

Product Variety – High, Delivery Performance – Low, Volume Flexibility – Low → Product Variety – High, Delivery Performance – High, Volume Flexibility – High.

The transition is from objectives under S3 to objectives under S8.

TABLE OF CHANGES

Plant and equipment	No major changes required Change is easy to achieve.
PPC	Restructuring not required. Change easy to achieve
Labor	No major changes. Change is easy to achieve.
Organization structure	No changes required.
Vertical integration	No change required
Vendor relations	Competitive relationship → JIT purchasing strategy.

CATEGORIZATION

In this transition changes in the hard decisions are of moderate difficulty No major changes are required in the soft decisions This transition will be easy to achieve.

CASE D-7

Product Variety – Low, Delivery Performance – High, Volume Flexibility – Low → Product Variety – Low, Delivery Performance – High, Volume Flexibility – High.

The changes are from objectives under S5 to objectives under S6.

TABLE OF CHANGES

Plant and equipment	No major changes involved This change is easy
PPC	No changes are required
Labor	No changes are required
Organization structure	No changes required.
Vertical integration	No change required
Vendor relations	They will continue with the JIT purchasing strategy

CATEGORIZATION

In this transition changes in the hard decisions are easy to achieve. No changes are involved in the soft decisions. This transition will be easy to achieve.

CASE D-8

Product Variety – High, Delivery Performance – High, Volume Flexibility – Low → Product Variety – High, Delivery Performance – High, Volume Flexibility – High.

The transition is from objectives under S7 to objectives under S8

TABLE OF CHANGES

Plant and equipment	No major changes involved. This change is easy.
PPC	Restructuring of group not necessary. Change is easy
Labor	No change required
Organization structure	No change required.
Vertical integration	No change
Vendor relations	Will continue with the JIT purchasing strategy.

CATEGORIZATION

In this transition no major changes are involved in the soft decisions The changes in the hard decisions are easy to achieve This transition will be easy to achieve.

Changes of moderate difficulty

CASE D-9

Product Variety – Low, Delivery Performance – Low, Volume Flexibility – Low → Product Variety – Low, Delivery Performance – Low, Volume Flexibility – High.

The transition is from objectives under S1 to S2.

TABLE OF CHANGES

Plant and equipment	Changes required are of moderate difficulty.
PPC	No major changes are required Changes required are easy to achieve.
Labor	No major changes required Changes required are easy to achieve.
Organization structure	Centralization high → low
Vertical integration	High → moderate
Vendor relations	Cooperative relationship → Competitive relationship

CATEGORIZATION

Since changes are required in both the hard and soft decisions this transition is of moderate difficulty to achieve

CASE D-10

Product Variety – Low, Delivery Performance – Low, Volume Flexibility – Low → Product Variety – Low, Delivery Performance – High, Volume Flexibility – High.

The transition is from objectives under S1 to S6.

TABLE OF CHANGES

Plant and equipment	Changes are of moderate difficulty to achieve
PPC	Restructuring of this group required
Labor	No major changes required
Organization structure	Formalization High → Low, Centralization High → Low. No changes required in the other dimensions
Vertical integration	High → Low
Vendor relations	Will adopt a JIT kind of purchasing strategy

CATEGORIZATION

In this transition changes in hard decisions are of moderate difficulty to achieve. Changes are involved in the soft decisions also This transition is of moderate difficulty to achieve.

CASE D-11

Product Variety – High, Delivery Performance – Low, Volume Flexibility – Low → Product Variety – Low, Delivery Performance – Low, Volume Flexibility – High.

The transition is from objectives under S3 to objectives under S6.

TABLE OF CHANGES

Plant and equipment	Major changes are required Changes are difficult to achieve.
PPC	Restructuring of group is necessary. Change is difficult.
Labor	Change is easy to achieve
Organization structure	Specialization High → Low, Standardization Low → High, Formalization Low → High, Centralization Low → High, Complexity of workflow High → Low
Vertical integration	No change.
Vendor relations	No change.

CATEGORIZATION

In this transition changes are involved in both hard decisions and soft decisions But changes are of moderate difficulty This transition will be moderately difficult to achieve

CASE D-12

Product Variety – High, Delivery Performance – Low, Volume Flexibility – Low → Product Variety – Low, Delivery Performance – Low, Volume Flexibility – High.

The transition is from objectives under S4 to objectives under S6.

TABLE OF CHANGES

Plant and equipment	Major changes are required Changes are difficult to achieve.
PPC	Restructuring of group is essential Change is difficult
Labor	No major change required Change is easy to achieve
Organization structure	Specialization High → Low, Standardization Low → High, Formalization Low → High, Complexity of workflow High → Low
Vertical integration	No change.
Vendor relations	No change

CATEGORIZATION

In this transition the hard and soft issues as a whole are moderately difficult to achieve This transition will be moderately difficult to achieve

CASE D-13

Product Variety – High, Delivery Performance – Low, Volume Flexibility – High → Product Variety – High, Delivery Performance – High, Volume Flexibility – Low.

The transition is from objectives under S4 to objectives under S7.

TABLE OF CHANGES

Plant and equipment	Changes are of moderate difficulty
PPC	No major changes required Changes are easy to achieve
Labor	No changes required.
Organization structure	No changes required
Vertical integration	No change in the level of vertical integration
Vendor relations	Competitive relationship →JIT purchasing strategy.

CATEGORIZATION

In this transition changes in the hard decisions are of moderate difficulty. No major changes in the soft decisions are required. This change will be of moderate difficulty to achieve

Changes most difficult to achieve

CASE D-14

Product Variety – Low, Delivery Performance – Low, Volume Flexibility – Low → Product Variety – High, Delivery Performance – Low, Volume Flexibility – Low.

The transition is from objectives under S1 to S3.

TABLE OF CHANGES

Plant and equipment	Changes required are difficult to achieve
PPC	Major changes required Changes are difficult to achieve.
Labor	Major changes required Changes are difficult to achieve
Organization structure	Specialization Low → High, Standardization High → Low or No change if PWP in place, Formalization High → Low, Centralization High → Low, Complexity of workflow Low → High
Vertical integration	High → Low
Vendor relations	Cooperative Relationship → Competitive relationship

CATEGORIZATION

We find that in this transition major changes are required in both the soft and hard decision areas. Hence this transition will be difficult to achieve

CASE D-15

Product Variety – Low, Delivery Performance – Low, Volume Flexibility – Low → Product Variety – High, Delivery Performance – Low, Volume Flexibility – High.

The transition is from objectives under S1 to S4.

TABLE OF CHANGES

Plant and equipment	Changes required are difficult to achieve.
PPC	Major changes required Changes are difficult to achieve.
Labor	Major changes required Changes are difficult to achieve.
Organization structure	Specialization Low → High, Standardization High → Low or no change if PWP in place, Formalization High → Low, Centralization High → Low, Complexity of workflow Low → High
Vertical integration	High → Low.
Vendor relations	Cooperative Relationship → Competitive relationship.

CATEGORIZATION

In this transition major changes are required in both hard and soft manufacturing decisions This transition will be difficult to achieve.

CASE D-16

Product Variety – Low, Delivery Performance – Low, Volume Flexibility – Low → Product Variety – High, Delivery Performance – High, Volume Flexibility – Low.

The transition is from objectives under S1 to objectives under S7.

TABLE OF CHANGES

Plant and equipment	Changes required are difficult to achieve
PPC	Complete restructuring of group required.
Labor	Major changes required Changes are difficult to achieve.
Organization structure	Specialization Low → High, Standardization High → Low or no change if PWP is in place, Formalization High → Low, Centralization High → Low, Complexity of workflow Low → High
Vertical integration	High → Low.
Vendor relations	Adopt a JIT purchasing strategy

CATEGORIZATION

In this transition major changes are required in both hard and soft decisions. This transition will be difficult to achieve

CASE D-17

Product Variety – Low, Delivery Performance – Low, Volume Flexibility – Low → Product Variety – High, Delivery Performance – High, Volume Flexibility – High.

The transition is from objectives under S1 to objectives under S8.

TABLE OF CHANGES

Plant and equipment	Major changes required. Changes are difficult to achieve
PPC	Restructuring of the group is essential. Change is difficult to achieve.
Labor	Major changes required. Change is difficult to achieve.
Organization structure	Specialization Low → High, Standardization High → Low or no change if PWP is in place, Formalization High → Low, Centralization High → Low, Complexity of workflow Low → High.
Vertical integration	High → Low.
Vendor relations	Adopt a JIT purchasing strategy

CATEGORIZATION

In this transition major changes are required in both hard and soft decisions This transition will be difficult to achieve

CASE D-18

Product Variety – Low, Delivery Performance – Low, Volume Flexibility – High → Product Variety – High, Delivery Performance – Low, Volume Flexibility – Low.

The transition is from objectives under S2 to objectives under S3.

TABLE OF CHANGES

Plant and equipment	Major changes required Changes are difficult to achieve
PPC	Restructuring of the group is required
Labor	Major changes are required.
Organization structure	Specialization Low → High, Standardization High → Low or no change if PWP is in place, Formalization High → Low, Centralization High → Low, Complexity of workflow Low → High
Vertical integration	Moderate → Low
Vendor relations	No change required

CATEGORIZATION

In this transition changes are required in both hard and soft decisions
This transition will be difficult to achieve

CASE D-19

Product Variety – Low, Delivery Performance – Low, Volume Flexibility – High → Product Variety – High, Delivery Performance – Low, Volume Flexibility – High.

The transition is from objectives under S2 to objectives under S4.

TABLE OF CHANGES

Plant and equipment	Major changes required Changes are difficult to achieve.
PPC	Restructuring of the group is essential.
Labor	Major changes are required.
Organization structure	Specialization Low → High, Standardization High → Low or no change if PWP is in place, Formalization High → Low, Centralization High → Low, Complexity of workflow Low → High
Vertical integration	Moderate → Low
Vendor relations	No change required

CATEGORIZATION

In this transition changes are required in both hard and soft decisions
This transition will be difficult to achieve

CASE D-20

Product Variety – Low, Delivery Performance – Low, Volume Flexibility – High → Product Variety – High, Delivery Performance – High, Volume Flexibility – Low.

The transition is from objectives under S2 to objectives under S7.

TABLE OF CHANGES

Plant and equipment	Major changes required Change is difficult to achieve
PPC	Restructuring of the group is essential Change is difficult.
Labor	Major changes required Change is difficult to achieve
Organization structure	Specialization Low → High, Standardization High → Low or no change if PWP is in place, Formalization High → Low, Centralization High → Low, Complexity of workflow Low → High
Vertical integration	No change
Vendor relations	Competitive relationship → JIT purchasing strategy.

CATEGORIZATION

In this transition major changes are required in both hard and soft decisions This transition will be difficult to achieve.

CASE D-21

Product Variety – Low, Delivery Performance – Low, Volume Flexibility – High → Product Variety – High, Delivery Performance – High, Volume Flexibility – High.

The transition is from objectives under S2 to objectives under S8.

TABLE OF CHANGES

Plant and equipment	Major changes are required Change is difficult to achieve
PPC	Restructuring of the group is essential. Change is difficult
Labor	Major changes required. Change is difficult to achieve
Organization structure	Specialization Low → High, Standardization High → Low or no change if PWP is in place, Formalization High → Low, Centralization High → Low, Complexity of workflow Low → High
Vertical integration	No change.
Vendor relations	Competitive relationship → JIT purchasing strategy

CATEGORIZATION

In this transition major changes in both hard and soft decisions are involved This transition is difficult to achieve.

CASE D-22

Product Variety – High, Delivery Performance – Low, Volume Flexibility – Low → Product Variety – Low, Delivery Performance – High, Volume Flexibility – Low.

The transition is from objectives under S3 to objectives under S5.

TABLE OF CHANGES

Plant and equipment	Major changes are required Change is difficult to negotiate
PPC	Restructuring of the group required Change is difficult to achieve
Labor	No major changes required Change is easy to achieve
Organization structure	Specialization High → Low, Standardization Low → High Formalization Low → High, Centralization Low → High, Complexity of workflow High → Low
Vertical integration	Low → High
Vendor relations	Competitive relationship → Cooperative relationship.

CATEGORIZATION

In this transition major changes are required in the hard decisions and in most of the soft decisions This change will be difficult to achieve

CASE D-23

Product Variety – High, Delivery Performance – Low, Volume Flexibility – High → Product Variety – Low, Delivery Performance – High, Volume Flexibility – Low.

The transition is from objectives under S4 to objectives under S5.

TABLE OF CHANGES

Plant and equipment	Major changes required. Changeover is difficult to achieve
PPC	Restructuring of group required. Change is difficult.
Labour	No major change required.
Organization structure	Standardization Low → High, Specialization High → Low, Formalization Low → High, Complexity of workflow High → Low
Vertical integration	Low → High.
Vendor relations	Competitive relationship → Cooperative relationship.

CATEGORIZATION

In this transition major changes are involved in both hard and soft decisions This change will be difficult to achieve.

CASE D-24

Product Variety – High, Delivery Performance – Low, Volume Flexibility – Low → Product Variety – High, Delivery Performance – High, Volume Flexibility – High.

The transition is from objectives under S4 to objectives under S8.

TABLE OF CHANGES

Plant and equipment	Changes are difficult to achieve
PPC	No major changes required.
Labor	No changes required.
Organization structure	No changes required.
Vertical integration	No change in the level of vertical integration.
Vendor relations	Competitive relationship → JIT purchasing strategy

CATEGORIZATION

In this transition changes in hard decisions are difficult to achieve No major changes in the soft decisions are required. This transition will be difficult to achieve

CASE D-25

Product Variety – Low, Delivery Performance – High, Volume Flexibility – Low → Product Variety – High, Delivery Performance – High, Volume Flexibility – Low.

The transition is from objectives under S5 to objectives under S7.

TABLE OF CHANGES

Plant and equipment	Major changes involved Change is difficult to achieve
PPC	Restructuring of group is essential. Change is difficult.
Labor	Major changes required Change is difficult to achieve
Organization structure	Specialization Low → High , Standardization High → Low or no change if PWP is in place, Formalization High → Low, Complexity of workflow Low → High.
Vertical integration	High → Low.
Vendor relations	Cooperative relationship → JIT purchasing strategy.

CATEGORIZATION

In this transition major changes are involved in both the hard and soft decisions This transition will be difficult to achieve

CASE D-26

Product Variety – Low, Delivery Performance – High, Volume Flexibility – Low → Product Variety – High, Delivery Performance – High, Volume Flexibility – High.

The transition is from objectives under S5 to objectives under S8.

TABLE OF CHANGES

Plant and equipment	Major changes required. Change is difficult to achieve.
PPC	Restructuring of group is essential Change is difficult to achieve.
Labor	Major changes required. Change is difficult to achieve.
Organization structure	Specialization Low → High , Standardization High → Low or no change if PWP is in place, Formalization High → Low, Complexity of workflow Low → High
Vertical integration	High → Low.
Vendor relations	Cooperative relationship → JIT purchasing strategy.

CATEGORIZATION

In this transition major changes are involved in both hard and soft decisions This transition will be difficult to achieve

CASE D-27

Product Variety – Low, Delivery Performance – High, Volume Flexibility – High → Product Variety – High, Delivery Performance – High, Volume Flexibility – Low.

The transition is from objectives under S6 to objectives under S7.

TABLE OF CHANGES

Plant and equipment	Major changes involved Change is difficult to achieve
PPC	Restructuring of group is essential Change is difficult to achieve
Labor	Major changes involved. Change is difficult to achieve
Organization structure	Specialization Low → High , Standardization High → Low or no change if PWP is in place, Formalization High → Low, Complexity of workflow Low → High
Vertical integration	No change.
Vendor relations	No change

CATEGORIZATION

In this transition major changes are involved in some of the hard decisions. Major changes are involved in all the soft decisions. This transition will be difficult to achieve.

CASE D-28

Product Variety – Low, Delivery Performance – High, Volume Flexibility – Low → Product Variety – High, Delivery Performance – High, Volume Flexibility – High.

The transition is from objectives under S6 to objectives under S8.

TABLE OF CHANGES

Plant and equipment	Major changes required Change is difficult to achieve
PPC	Restructuring of group is essential Change is difficult to achieve
Labor	Major changes required Change is difficult to achieve
Organization structure	Specialization Low → High , Standardization High → Low or no change if PWP is in place, Formalization High → Low, Complexity of workflow Low → High.
Vertical integration	Moderate → Low.
Vendor relations	No change

CATEGORIZATION

In this transition changes in both hard and soft decisions are difficult to achieve. This transition will be difficult to achieve.

CHAPTER-4

SOLUTION METHODOLOGY

In this chapter we have given the details of the process through which we have verified the hypothesis given in chapter 3. We studied a firm's past and present manufacturing objectives and decisions they made on various dimensions such as organization structure, vendor relations, vertical integration, plant and equipment, labor skills and production planning and control.

Initially we had made a pilot survey from the questionnaire prepared by us for two or three companies. From the suggestions made by the production managers and the other personals we made the necessary modifications in the questionnaire. For knowing the initial stage (objectives five to seven years back) we have relied both on the questionnaire and the interviews taken from different personal like that from marketing, manufacturing, personal departments etc. For the initial objectives we have to know the past status i.e. 5 to 7 years back which was not possible to infer from the data only. So we had taken interviews from different production, marketing and other personal plus in some cases from the old workers and supervisors. For knowing the final objectives we totally relied upon the data from the questionnaire.

4.2 Organization Of The Questionnaire:

As per the data collection from the questionnaire is concerned we have divided the questionnaire into 4 part. The part I contained in the page 1 contains the details of the name of the company, products produced by it and the details of the personal to which we had visited.

Part II gives the details of the objectives made by the company five to seven years' back and the present objectives. We have also scaled the objectives (1-7 scale) at which they rate their present and the past objectives and from that we had infer whether the company had gone through any change in their objectives. This part of is contained in the page 1 and 2 of the questionnaire. Part III of it gives the details of the type of production planning and control done, level of automation, vertical integration, vendor relation etc. In the production planning and control (PPC) group the type of

planning used by the plant and the type of inventory management system followed by it was studied. For studying the labor skills the type of labor hired by the company and the training provided to them are studied. For the vertical integration the value of in-house production and the value of assemblies purchased by the company was taken from the data. For knowing the vendor relations the number of vendor per product and the type of relationship with the vendor (vendor not important, competitive and co-operative) are measured. This part is contained in the page 3 and 4 of the questionnaire.

At last we have prepared the questions meant for studying the organization structure. Here we have studied the various aspect of the organization structure like the standardization (the level of the use of standard procedure in the plant), specialization (the level of use of specialized jobs for the organization), centralization (the level of decisions making authority in the plant), formalization (the level of the use of documented procedures in the organization) and at last the complexity of the workflow (here the interaction level among various departments are studied). For each of these structures a standard scale has been prepared for a scale of 1-7. These are the standard scales were borrowed from the paper "Dimensions of organization structure", by P.S. Pugh and D.J. Hickson published in the administrative science quarterly. The last part of the questionnaire from page number 5 to 10 contains all these details about the questions related to the organization structure.

4.3 Solution Methodology:

Raddy (1999) had developed a theoretical framework and hypothesis for the static and the dynamic models. Taking the three objectives i.e. product variety, volume flexibility and delivery performance and based on these we had developed 8 static models. From these 8 static models by taking different permutations of making the prospective changes in the objectives Reddy (1999) had developed 28 dynamic cases.

To validate these cases two methods can be applied, either the questionnaire survey or the case study. Questionnaire survey is less costly than the case study method and more samples can be collected for that case in lesser time. Again due to the diverse statements and many dynamic cases it requires a lot of sample to validate the

theoretical framework As so many studies was not possible due to the limited resources and time constraint questionnaire study was adopted.

In the questionnaire based study a moderate sample size was taken for validating the framework To validate the huge number of the dynamic cases there was very few (1-2) samples for the dynamic case. So the use of statistical tool is limited Hence we have gone for purely analysis from the data and the responses received. Every attempt was made to choose the sample company as diverse as possible. Due to the very few number of samples it was not possible to cover each aspect of the framework Most of the companies chosen are in the city of Kanpur, Lucknow and Delhi.

The name of the companies from where samples were collected is given in the appendix-A. The questionnaire is given in the appendix-B The analysis of the questionnaire is given in the next chapter. All the responses are for testing the static and the dynamic cases After testing the cases with the hypothesis the related changes or the modifications were attempted in the static or the dynamic cases of our hypothesis whenever it is deviating from the hypothesis.

CHAPTER-5

ANALYSIS OF THE DATA

An analysis of the data has been done in this chapter. Here we have presented the data collected through the questionnaire and the interviews. The purpose of the collection of the questionnaire and the data is to validate the hypothesis proposed in the chapter 3 and to revise and modify it

For validating the framework presented in the chapter 3 we had to collect data from those companies which made change in their manufacturing objectives during the past 5 to 7 years and we have tried our best to cover those companies which are dynamic in nature. But for two cases we have found the company not making any change in the past 5 to 7 years and are remaining static in nature. For rest of the case they are making change and are dynamic in nature. For validating the framework we have collected data from 16 companies in and around Kanpur, Lucknow and Delhi. Due to the vastness of the hypothesis it is not possible to use any statistical tool. So the analysis is purely done on subjective basis. In the present chapter we are going to present the analysis of all the 16 companies that we have studied

5.1 RELATING OBJECTIVES TO MANUFACTURING DECISIONS:

Here we have verified through analysis the framework proposed in the chapter 3 regarding the change in the manufacturing objectives and how a company changes its manufacturing decisions to meet the change in these objectives. For each of the transitions we have studied two stages i.e. initial and the final stage. For the initial stage i.e. the data 5 to 7 years back we had relied upon the questionnaire plus the interviews taken from those people from marketing, personnel and manufacturing departments who are in that company for the last 7 years or more. We had also followed the balance sheets and annual reports where it was possible. For knowing the present status we had relied totally upon the questionnaire. After knowing the present and the past status we have studied what type of dynamic changes a company has made and how

it had taken decisions to meet the change in objectives After analyzing the data thrice for initial static case, final static case and the dynamic case made by the company we had studied how it is matching with our original hypothesis At the end of each analysis for the static and dynamic case we have given proper reason for the deviation from the hypothesis

Case no. 1

LOHIA STARLINGER LIMITED

Lohia Starlinger Limited, a part of the Lohia group of companies had set up its plant in the city of Kanpur in the year 1983 Their first company was established in the Panki area to produce woven fabrics The other plant visited by us was opened in the year 1983 for producing stream tape extrusion. Another three independent units are also established to produce different products. One is a CNC workshop to meet 80% in-house demand and 20% other. Another inject-plant is there to meet the 50% in-house demand and 50% for the customers like Maruti, Delphi etc another unit is there to produce industrial threads and other domestic products.

INITIAL OBJECTIVES:

Product variety: - low, delivery performance: - high, volume flexibility: - high.

This falls in the static *case number 6* of our hypothesis and to meet these objectives the manufacturing decisions taken by the plant 7 years back was as follows:

Plant and equipment: - Initially there was having a lot of special purpose machines with the ratio of the special to the general-purpose machines is 65. 35. The plant was of a moderate size with a lot of buffer stock kept for meeting the delivery date So we are getting a very good support for our hypothesis.

PPC: - The group was not having much importance with built up run down inventory was done for planning Also they were following classical kind of the inventory management system. The low product variety will make the group a less important one and giving support to the hypothesis

Labor skills: The type of the labor force hired by the company was of the semi-skilled type with a low training given to them. So the low product variety will not necessitate multi skilled labor and we are getting a good support to our hypothesis.

Organization structure: -

Standardization: - This value was found at a high score of 5.0, which is a high value and due to the high product variety the use of standard procedures was very high in the plant and is giving support to the static case S-6.

Specialization: The score of the use of the specialized jobs in the organization was found to be 4.11, which we can say is a moderate value and the low product variety will keep it low. So we are getting a moderate support to our hypothesis.

Centralization: The score in centralization was found at 5.0, which is a high value. But the high delivery performance and volume flexibility should keep it low, as the decisions on setup time should be taken at the lower level. So we are getting a low support in this case for our hypothesis.

Formalization: The score of the use of the documented procedure in the organization was found to be 4.78, which is a high value and we are getting support for the hypothesis as the low product variety led the plant to use all documented procedures.

Complexity of the workflow: The interaction level in the organization was found to be at a moderate value of 4.25, but the low product variety will make it low so we are getting a moderate support to the hypothesis here.

Vertical integration: The value addition within the plant was 50% of the total cost of sales. This moderate value in vertical integration gives a good support to our hypothesis.

Vendor relation: The number of vendor for a particular product was found to be 3 with a partly competitive and partly co-operative relationship with the vendor. So here we are getting a partial support to the hypothesis.

From the analysis we got a low support for centralization and moderate to high support for all the other cases and hence getting good support for S-6.

***** Hypothesis related to the static case 6 revised as stated:***

1. For a small organization owner may have desire for power and control then the score on centralization is likely to be high.

FINAL OBJECTIVES:

Present manufacturing objectives of the organization is found as follows

Product variety: - high, delivery performance: - high, volume flexibility: - high.

This matches with the ***static case number 8*** and to achieve these objectives the manufacturing decisions taken by the firm are

Plant and equipment: - This has gone through a lot of change with the ratio between general to the special purpose machines is now 3: 2, to meet the high product variety. So it is giving a very good support to the hypothesis.

PPC: -This group still doesn't have much importance in the organization although the high product variety should make it a very important group So here we are getting a very poor support to the hypothesis

Labor skills: - The type of labor hired by the company is now of skilled with good training provided to them This is to meet the requirement of handle general-purpose machines. So we are getting a good support here for the static case8.

Organization structure:-

Standardization: - The value was found to be 5.25, which is a very high value The high value is due to the presence of plant within plant and hence despite of the high product variety they are using standardized procedure So it gives support to the hypothesis

Specialization: -Due to the high product variety and delivery performance the use of the specialized people in the plant was very high and the score is 5.45. So this is also supporting our hypothesis

Centralization: - This score was found to be very high at 5.0. But the high objectives should make the decision making at the lower level at the lower level to be very high. So this score is giving a weak support to the hypothesis.

Formalization: -This score was found at a high value of 4.78 which gives a very low support to us as for a high product variety documentation will not be possible everywhere So it gives a low support to our hypothesis

Complexity of the workflow: - The interaction between different departments is high with a score of 5, which gives support to the hypothesis

Vertical integration: - The value addition in the plant is now at 30%. As the product variety and delivery performance is high the dependence on the vendor will be high. So the low value of the vertical integration supports the hypothesis.

Vendor relation: - The relationship with the vendor is now of partly co-operative and partly competitive type which gives support to our hypothesis.

From the above analysis we are getting full support to the hypothesis for the static case S-8 except for the case of PPC, formalization and centralization.

****** Hypothesis related to the static case number 8 revised as stated:***

1. Despite of high product variety if there are many plants within plant then PPC will continue to have low importance in the plant.
2. Despite of the high objectives the plant will continue to have a high centralization as the owner of the plant is having high desire for control and power.
3. The presence of a lot of plants within the plant the organization can have high documentation of the procedures and hence the score on formalization may be high.

RELEVANCE TO THE HYPOTHESIS: -

The plant has gone through the following changes in their objectives during the past 7 years:

Product variety: - low, delivery performance: - high, volume flexibility: - high →

Product variety: - high, delivery performance: - high, volume flexibility: - high.

The above case falls on the ***dynamic case number D-28*** and to meet the change the decisions taken by the plant are as follows.

Plant and equipment: - This has gone through certain changes with the ratio of the special to the general-purpose machines shifted from 13.7 to 2.3. So to meet the high product variety they have made these changes giving a good support to the hypothesis.

PPC: - Despite of the change of the objective of low to high product variety the PPC group has not gained much importance in the organization. So we are getting a low support for the hypothesis.

Labor skills: - The kind of the labor force hired by the plant has shifted from moderately skilled to now of the type highly skilled. This is to meet the demand of high product

variety and hence they have to handle general-purpose machines. So this gives a good support for the hypothesis.

Organization structure: -

Standardization: - The level of use of the standardized procedure in the organization has increased from 5.0 to 5.25. The reason is the presence of the plant within plant, which made the organization use only standardized procedures. So this gives support to our hypothesis.

Specialization: - The use of the specialized people in the organization has found increasing from 4.11 to 5.45. This high use of specialized people is due to the increase in the product variety and it gives a good support to the hypothesis.

Centralization: The decision making authority is at the higher level with a high score of 5.0. But the high objectives should make it low so we are getting a weak support to the hypothesis.

Formalization: - The use of the formal procedure in the plant is remaining constant at 4.78. But for the high objectives the documentation will not be possible and we are getting a low support for the hypothesis.

Complexity of the workflow: - The score has been changing from 4.25 to a high 5.25 giving a good support to our hypothesis.

Vertical integration: - The vertical integration level is decreasing from a moderate value to a low value. This decrease is due to the increase in the product variety the dependence with the vendor will be high and the value addition inside the plant is low. So this is also giving a good support to the hypothesis.

Vendor relation: - The relationship with the vendor is partly of co-operative and partly competitive. So this is giving a good support to our hypothesis.

So from the above analysis we are getting a good support for *the dynamic case number 28* except for the case of PPC, centralization and formalization. This kind of change is very difficult to achieve and the company has made the change successfully in the past 7 years.

******Hypothesis related to the dynamic case number 28 revised as stated: -***

1. Despite of the high product variety the presence of the plant within plant made the PPC a less important group in the organization.

2. Despite of the high objectives the plant will continue to have a high centralization as the owner of the plant is having high desire for control and power
3. Due to the presence of plant within plant, the documentation of all the procedures was very high So the formalization can be of high value

Case no.2

EMA INDIA LIMITED

EMA INDIA LIMITED, one of the prime machine tool producers has its plant in the city of Kanpur In the Kanpur plant they are bringing various parts from the other companies from India and Germany and assembling the machine tools according to the requirements of their customers

INITIAL POSITION

Manufacturing objectives of the company 7 years back was as given below

Product variety: - low, delivery performance: - low, volume flexibility: - low.

This falls on the **static case number 1** of our hypothesis and to match the above manufacturing objectives the manufacturing decisions taken were as below

Plant and equipment: The low product variety has compelled the plant to use only the special purpose machine with no use of the general machines in the plant The use of the flow lines was also very limited in the plant. So here we are getting a good support to the assumptions of our hypotheses.

PPC: There was no formal PPC group in the organization due to the small in size of the organization They were adding shifts to increase capacity The inventory management system followed by the firm was of classical kind type. So here we are getting good support to our static case.

Labor skills: The low level of all the three objectives forced the plant to use a combination of low and moderate skilled labor with a very low training provided to them as they had to do the repetitive kind of job giving a good support to our hypothesis.

Organization structure:

Standardization: The level of the standardization in the organization was found to be at a score of 5.22, which is a high value All the objectives at their lower position make the organization to use only the standard procedures and hence this is giving a good support to the hypothesis

Specialization: This level was found at a moderate value at 4.3. But the low product variety makes the plant to use very few specialized people, as there is no need to the distribution of the official duties among the employees. So the moderate value in the specialization level is giving a low support to our hypothesis.

Centralization: The level of decision-making authority among the employees was at the higher level making the centralization level at 4.81. As all the decisions regarding the change in the set up time and change in the product was taken at the higher level due to the low delivery performance and the low volume flexibility, the high score is giving a good support to our static case 1.

Formalization: This level was found very low at 3.27. Although the low level of the product variety makes the plant to document all the procedures, instructions and communications but here we are finding the value to be very low and hence it is not matching with our hypothesis.

Complexity of the workflow: This score was found very low at 3.0. As the product variety was low so there was a very low interaction among the departments and hence this is giving a good support to our hypothesis.

Vertical integration: This level was found at 40% so for most of the product they had to depend on the outside vendor. Also the cost of assemblies are 60% of the final value of the output. But the low product variety should make the in-house production very high and hence here we are getting a very low support to our hypothesis.

Vendor relation: The number of vendor in the firm for a particular product was 3 with a co-operative relationship with the vendor with a high bargaining power due to the low objectives giving a good support to our static case.

So from the above analysis of the data we have found a good support to the **static case no. 1** except for the case of vertical integration, specialization and formalization.

*****Hypothesis relating to static case number S1 is revised as under**

1. The high level of standardization may not necessitate the plant to use documented procedures and hence formalization can be low.
2. Being a small firm there was scarcity of fund and hence the firm may not be able to have a very high score on vertical integration.

3 Since the company is a small company and they are engaged in lean manufacturing so the score on specialization may be low

FINAL OBJECTIVES:

Presently the firm is having the following manufacturing objectives

Product variety: - low, delivery performance: - high, volume flexibility: - high.

This falls under ***static case number 6*** and to match the final objectives the decisions taken by the firm are as follows

Plant and equipment: Presently also the plant is using the special purpose machines with addition of a very few general-purpose machines. The addition of high delivery performance has made the plant to keep buffer inventories. So we are getting full support in this case to our hypothesis.

PPC: This group has gone through certain improvement and the plant is now using scheduling for their medium terms planning and the high delivery performance has led to this. Again the inventory management has now of MRP kind of system. So we are getting a moderate support in this case as the group has gained a lot of importance now.

Labor skills: The kind of the labor forces hired by the firm is now a combination of semi and moderate skilled and the training provided to them is also moderate. This is to meet the productive demand of volume fluctuation and delivery performance. So here also we are getting support to our hypothesis.

Organization structure:

Standardization: This level is remaining at a constant level at 5.22. As the variety of product introduced in the market by the firm is still low so no need to use any non standard procedure and hence level is remaining at a very high level satisfying our hypothesis.

Specialization: This level has now changed to a very high at 5.0. But the low product variety should keep it at a low value and hence giving a low support to our hypothesis.

Centralization: The plant is now less centralized with the score at 4.18. This may be due to the need to meet the delivery date and hence decisions have to be taken at the lower level management. So here we are getting a moderate support to our hypothesis.

Formalization: The level of formalization has now at very high level at 5.18. As the product variety is low so all the documented procedures are used in the organization and

communications is also very high keeping this value at very high. So here also we are getting a good support to our case

Complexity of the workflow: The interaction between various departments has now decreased and the level is at 2.33. As the product variety is low so there is no interaction among the departments and this low value is giving a good support to our hypothesis

Vertical integration: This level has remained at 40% and still the company is dependent on outside vendors. Also the assemblies from outside is 70% as the product variety is low and also to meet the delivery date they have to bring a lot from outside. So this score is giving a very weak support to our hypothesis

Vendor relation: The number of vendors for a particular product has now been 4, as the firm has to depend more on the vendor for the delivery date and the volume variation. Also now they have applied competitive relationship with the vendor giving a poor support in this case also

So from the above analysis we are getting a poor support for the case of vertical integration, vendor relation and specialization and good support for other cases.

****** Hypothesis related to the static case number S6 has been revised as below:***

1. For meeting the delivery dates the plant needs more specialized jobs for achieving higher efficiency and hence the score on specialization is likely to be high.
2. Being a small firm there was scarcity of funds and hence the firm may not be able to have a very high score on vertical integration.
3. The vendor relation is dependent on the vertical integration and due to the low value of vertical integration the plant may go for a competitive relationship with the vendor. Again the high volume flexibility will lead for a competitive and high delivery performance for a co-operative relationship with the vendor. For this case we are getting more support for a competitive relationship and so it may go for a competitive relationship with the vendor.

RELEVANCE TO OUR HYPOTHESIS:

Following changes occurred in the plant during the last 7 years:

Product variety: - low, delivery performance: - low, volume flexibility: - low →

Product variety: - low, delivery performance: - high, volume flexibility: - high.

The above falls under dynamic *case number D-10*, and changes in the manufacturing decisions taken by the organization to match the change in the objectives.

Plant and equipment: There was not any substantial change that occurred in the plant and the equipment except there is a change in the buffer stock kept by the plant which they have increased to meet the change in the delivery date. So we are getting full support to the case D-10

PPC: Here there are some changes occurred Although they have not set up a separate group to handle all these activities but still they have shifted from increase or decrease in shifts to the scheduling of the activities for the planning and also now have opted for the MRP kind of material management system So the change in the delivery performance and the volume fluctuation lead to this and giving a strong support to our hypothesis.

Labor skills: The change in the labor type has also not gone through drastic changes as the type of product they have to handle is same but now they are hiring semi and moderate skilled labor and giving moderate training to them So here also we are getting a very good support to our hypothesis.

Organization structure:

Standardization: As the variety of the product the plant has to deal is low so a lot of use of the standard procedure in the organization keeping the level at a very high level at 5.22 There is no change occurring in this score and hence giving a good support to us for validating our hypotheses

Specialization: This level has increased from 4.3 to 5.0 But according to the hypothesis it should remain low and hence we are getting poor support here

Centralization: This level has not gone through a drastic change with the level decreasing from 4.81 to 4.18 This certain level of the decrease is due to the change in the delivery performance and hence the lower level management took the decisions regarding the change in the set up times and the down time So here also we are getting support according to the hypothesis.

Formalization: There is an increase in this score from 3.27 to 5.18 But the level of documentation will decrease after the increase in delivery performance and volume flexibility. So here we are getting a very low support to our hypothesis.

Complexity of the workflow: The interaction level among the various departments is remaining very low with the value decreasing from 3.0 to 2.33. But with the change in the delivery performance and the volume change the interaction should increase to a certain level so we are getting a moderate support here

Vertical integration: The level of the vertical integration is remaining constant at 40% with the number of the assemblies brought from outside is increasing from 60% to 70% to match with the delivery performance and the change in the volume. As the in-house production should be high for the low product variety we are getting a low support to our hypothesis

Vendor relation: As the delivery performance and the volume fluctuation both are increasing the dependence on the vendors has increased and the relationship has changed from a co-operative to competitive type. Also the number of vendor for a particular product has increased from a number of 3 to now it is 4. The purchasing strategy is also now of JIT kind and hence we are getting a good support to our case.

So from the analysis of the dynamic case we are finding the relevance to the **dynamic case number.10** of our hypothesis in all the cases except for the case of specialization, formalization and vertical integration. So this is a moderately difficult type of the change to achieve and the company has made the changes according to our prediction in our hypothesis except in few cases.

***** Hypothesis related to the dynamic case number 10 have been revised as stated:**

- 1 The increase in the delivery performance led the plant to use specialized jobs for higher efficiency and hence the score on specialization may be high.
2. The high level on standardization may not necessitate the plant to use documented procedure and hence the score on standardization may be low.
- 3 Due to the scarcity of enough capital the firm may not be able to have a large in-house production and hence the vertical integration may be low.

CASE NO.3

DUNCANS INDUSTRIES LIMITED

Duncan industries limited, one of the prime product groups from the Goneka group of industries has its fertilizer production plant in the Kanpur. The group's prime product is fertilizer and hence has no variety in the product is found and also has a limited number of customers with the fixed amount of demand is there. Hence here we have found the manufacturing strategy of the firm non-changing and hence giving a relevance to the static case no 5 of the static cases and the objectives of the firm is remaining constant from the last five to seven years.

So the manufacturing objectives of the firm is as below.

Product variety: - low, volume flexibility: -low, delivery performance: - high

The above falls in the ***static case S-5*** of our hypothesis and to match the above manufacturing objectives the manufacturing decisions taken were

Plant and equipment: As seen from the objectives the plant has only one product i.e. fertilizer and hence, due to this low product variety the ratio of general to special purpose machinery used to in the plant is 3:7 in numbers. From the interview, it was found that they are using a heavy amount of buffer stock to meet the delivery performance. So we are getting a match to our hypothesis.

PPC: This group was found to be a moderately important group in the organization and are comprising of around 20 people. They are relying on scheduling of the activities and the on line data processing is high in the organization. The inventory management is not given any importance and are keeping very less inventory as it is readily available all the time. So here we are getting a moderate support to the hypothesis.

Labor skills: The kind of the labor force recruited by the firm is mostly of moderately skilled type. But the type of formal training provided to them is high to match with the delivery dates they will have to perform efficiently. So we are getting a match with the hypothesis.

Organization structure:

Standardization: The level of standardization in the organization is at a high score of 6.0. Due to the low product variety the organization is using only standard procedures and hence keeping the level very high supporting our hypothesis.

Specialization: The level of the use of the specialized people is very high at a level of 5.78. Although the low variety in the product should keep it at a low and hence the high score is not giving support to our hypothesis.

Centralization: The centralization level is found to be at a moderate value at 4.8. So as per decision making in the organization is concerned it is slightly decentralized as the decision regarding the change in the set up time and the production time were taken at the lower level management. But also any decisions regarding flow-lines are still taken at the higher level keeping it at a moderate value and fully supporting our hypothesis.

Formalization: this level is also found to be very high in the organization at 6.69 with a slight change from 6.23 to 6.69 during 7 years. Due to the low product variety the documentation of all the procedures is possible hence matching to our case no. 5.

Complexity of the workflow: This level has also changed from 4 to a high value of 5.0. But the low product variety should make it at a low value as the use of liaison bodies to co-ordinate the activities will be very low. So we are getting a moderate support in this case for the hypothesis.

Vertical integration: The value addition within the company is 40% making the vertical integration at a moderate value. But the high delivery performance and low variety in the product make it advantageous to produce in-house. So we are getting a moderate support for our hypothesis.

Vendor relation: The firm is hiring 2 vendors for their major product. As the delivery performance is high so the dependence of raw material in time to meet the delivery date will be high. So they are maintaining a very co-operative relationship with the vendor. So we are getting a support here.

So from the above analysis of the case we have found that all the manufacturing decisions taken by the firm are matching with our **static case no.5** except for the case of specialization. So overall we are getting a good support for our static case.

*****The hypothesis relating to the static case number S-5 is revised as under: -**

1. For meeting the high delivery performance the plant needs more specialized jobs for achieving higher efficiency and hence the specialization score is likely to be very high.

Case no.4

MARUTI UDYOG LIMITED

Maruti Udyog Limited, one of the major players in the car market in the Indian four wheeler segment entered the Indian market in the year 1982. It is government collaboration with the Suzuki Motors Company of Japan. It has filled the gap of the small-scale car segment for the middle class people. Presently it has large share of 70% in the Indian car market. The major products produced by it are Maruti800, Maruti Zen in the small car segment, Maruti esteem in the luxury segment and a number of the multi utility vehicle

INITIAL OBJECTIVES:

The initial objective of the company 8 years back was as below:

Product variety: - low, volume flexibility: - low, delivery performance: -low.

The above case falls on the *static case S-1* of our hypothesis and to meet the above objectives the manufacturing decisions taken by the company were as below.

Plant and equipment's: Initially the company was using only special purpose machines to meet the demand of the very low product variety. The capacities of the machines were also not so high as the level of the volume flexibility was also very low. The amount of the buffer stock kept was also very low to meet the demand of low product variety and all these findings gives a very good support to our hypothesis

PPC:- Initially the group was having a lot of importance in the organization despite of all the three manufacturing objectives taken was at their lowest level. The plant was relying heavily on scheduling. They were relying on the MRP kind of inventory management system. The on line data processing was also of moderate value. So we are not getting a good support to our hypothesis in this case.

Labor skills Initially due to the low product variety the labor force in the organization was of semi skilled type. The amount of the training provided to them was also moderate, as they had to handle only the special purpose machines. So it is giving a good support to our case S-1.

Organization structure:-

Standardization: As the product variety is low so the level of use of the standard procedures should be very high and the score on standardization was 5.11, which is giving a good support to our hypothesis.

Specialization: Due to the low level of the product variety the specialized people in the organization should be very low as there was less distribution of the official duties among them. But in our case we are getting the value at a high score of 5.25 and hence not matching with our hypothesis.

Centralization: A very high score on centralization was found for the organization at 5.51, which was due to the low objectives as most of the decisions were taken at the higher level and we are getting good support for the hypothesis.

Formalization: It is the level to which formal procedures are followed in an organization. The level of formalization was initially very high at a level of 5.78, as the product variety was very low and so also the volume flexibility so the operations will be highly formalized. Thus it matches with our hypothesis.

Complexity of the workflow: As we have deduced that the low value of the product variety will lead to a moderate level of interaction between departments and hence the value we have found from the analysis is of 4.0, which is a low value and hence giving support to the hypothesis.

Vertical integration: As the company people were not authorized to give any data related to the vertical integration so we were not able to draw any conclusion from this.

Vendor relation: The firm was having 1 vendor for a particular product or assembly with a co-operative relationship with the vendor, which is supporting our hypothesis.

So from the above analysis we are getting full support for the validation of the **static case no.1** of the hypothesis except for PPC group and for specialization.

*****The hypothesis related to static case 1 revised as shown:**

1. The plant being a very big plant and of high capacity so despite of the low dimensions they had to give more importance to the scheduling of the activities. So the PPC group can be a very important group for these kind of organization.

- 2 Based on the same logic being a very big plant they believed on hiring specialized people and doing specialized jobs So the score on specialization may be high for this case
- 3 Since Maruti Udyog is not engaged in lean manufacturing its score on specialization was very high for this organization So the score may be high for this kind of case

FINAL OBJECTIVES:

Product verity: -high, volume flexibility: - high, delivery performance: -high.

The above objectives falls under *static case S-8* and to meet the above final objective of the organization the decisions taken by the plant were as follows.

Plant and equipment's: As the plant has changed their strategy to high product variety hence the number of general-purpose machines has been increased substantially and now the proportion is general. special is 5:2 in numbers They have now gone for a plant of very big size and a lot of plants within the plant. Also the high level of the volume flexibility is leading to the use of multiple flow-lines. So here we are getting a good support to our static case S-8

PPC: Now as all the objectives are at their highest level so scheduling is a very important activity in the organization Now they are relying on the JIT kind of inventory management policy. On line data processing is also very high and setup time and run time is also very high Now the PPC group is a very important group in the organization So this is giving full support to our hypothesis.

Labor skills: Now the organization is hiring multi skilled labors and providing high amount of training during their tenure, which is due to the presence of general purpose machines and hence is supporting our hypothesis.

Organization structure:

Standardization: Due to the increase of the product variety the use of standard procedures will be very low. But in our case we are getting the value as 5.01, which is a high value This is due to the presence of plant within plant inside the organization as they were having a variety of products and separate assembly lines for each. So here also we are getting a good support for the static case S-8

Specialization: Due to the high variety of the product and the presence of plant within plant the level of specialized jobs in the organization is likely to be very high and in our

case we are getting the value as 6.25 which is very high and hence validating our hypothesis

Centralization: As the plant is required to have a high value of delivery performance and volume flexibility most of the decisions are now taken at the lower level. So the centralization level should be very low. But we are finding it very high at 5.51 and hence not getting support for our hypothesis.

Formalization: Due to the high level of product variety the interdepartmental interaction will be very high and the use of the formal procedures will be low. But in our case we are getting the value to be very high at 6.0 and hence not getting support to our case.

Complexity of the workflow: As all the objectives are very high so the complexity in the workflow will be very high. In our case we are getting the value at 4.6 which we can consider as a high value. So we are getting support to our hypothesis.

Vendor relation: With the high performance required on all the dimensions the company has increased the number of vendors to 3 per product. Also the dependence on the vendors has increased and the firm is going for a co-operative relationship with the vendor. So it is giving a moderate support to our hypothesis.

So from all the above analysis of the data we have found a good support to our static case number 7 except in the case centralization and formalization.

***** So the hypothesis related to the static case S-8 revised as stated:**

1. Despite of the high objectives the presence of the plant within plant may need the decisions to be taken by the higher level management and the score on centralization may be very high for this case.
2. The plant was having a very low use of the standardized procedures. But there is the presence of plants within plant, which may necessitate use of documented procedures in the organization. So the score on formalization may be found very high.

RELEVANCE WITH THE HYPOTHESIS:

From the data that has been analyzed we have found the organization has made the following changes in their manufacturing decisions.

Product variety:-low, delivery performance:- low, volume flexibility:- low →

Product variety:-high, delivery performance:- high, volume flexibility:- high.

The above change matches with the *dynamic case number D-17* of our hypothesis and to meet these changes the decisions taken by the plant were as follows

Plant and equipment's: From the analysis we have found that now the company has shifted itself from using special to general purpose machines. Again the high level of the volume flexibility lead to the use of flow-lines. So it is satisfying our hypothesis.

PPC: The plant has now opted for high level of all the three objectives. So now scheduling is a very important activity for them. Now they are paying more attention to the activities like the reduction of the setup time etc. So this is also giving support to our assumptions in the hypothesis.

Labor skills: The plant is now opting for high value of product variety so the labor is being changed from moderately to very highly and multi skilled labors. Again a lot of training is provided to meet the demand. So here also we are getting support to our hypothesis.

Organization structure:

Standardization: This value should decrease, as due to the change in the product variety the use of the standard procedure is very less. It is decreasing from a score of 5.11 to 5.01. So we are getting a good support to our hypothesis.

Specialization: As the plant is now using a large product variety so the number of the specialized people is very high. The level of specialization has increased from 5 to a very high value of 6.25. So here also we are getting a very good support.

Centralization: The plant should become lowly centralized due to the shift from low to a high value of volume flexibility and delivery performance. But in this case it is changing from 5.61 initial to 5.51 final. So here also not a drastic change has been occurred and hence giving moderate support to our hypothesis.

Formalization: Due to the low product variety the documentation of all the procedure will not be possible. So the level should shift from high to low. But here it is increasing from 5.78 to 6.0 and giving a very low support to our hypothesis.

Complexity of workflow: As the product variety and the delivery performance is increasing so the complexity will shift from low to high. Here also it has been shifted from 4.0 to 4.8 giving support to our hypothesis.

Vendor relation: To meet the demand in the fluctuation in the volume and the performance in delivery date the relationship with the vendor will be of competitive type. Here we are getting the same kind with a combination of cooperative relationship So here also we are getting a good support to our hypothesis

So from the above analysis we are getting support in all type of decisions except for formalization So overall it is giving a very good support to our *dynamic case number.17* of our hypothesis This kind of the change is of the type very difficult to achieve and the company had made the changes very successfully within a period of 7 years

***** *The small modification in the dynamic case D-17 has been made as stated:***

- 1.** The plant has shifted for a high of all the three objectives making all the procedures non-standardized Again there is presence of plant within plant So to compensate these two effected the plant may use highly documented procedures. So the score on formalization may be high for this case.

Case no.5

HERO HONDA MOTERS

Hero motors one of the premier two wheeler manufacturers in India started its journey as a cycle manufacturer four decades ago Now it is an ISO 9002 certified company and has collaboration with Honda motors to being the largest producer of motorcycles in India with substantial share in moped and auto ancillaries Its main products include Hero-Honda 100ss, splendor, CBZ etc.

INITIAL OBJECTIVES:

The initial objectives of the plant at 7 years back was as follows:

Product verity:- low, delivery performance:- low, volume flexibility:- high.

The above case falls on the *static case S-2* of our hypothesis and to meet the above objectives the plant had taken the following manufacturing decisions:

Plant and equipment's:- The organization were having a comparatively small plant to meet the low level of product verity and also were having multiple flow lines for the high fluctuation in the volume Also the low variation in the product lead to the use of a large

number of special purpose machines in the plant and the ratio of general to the special purpose machines was 4.6 in numbers. So these data on the plant and equipment is not matching with our hypothesis.

PPC: This group was also having a moderate importance in the organization. Although the delivery performance is low but the volume variation lead to the use of some scheduling policies and the plant was using build up inventories. Also the MRP kind of material management were in use with very moderate amount of on line data processing giving a moderate support to the hypothesis.

Labor skill: The labor force hired by the company initially was very semi-skilled and also initially very low to moderate amount of training provided to those people. This signifies that the low product variety led to the use of un-skilled labor force supporting the hypothesis.

Organization structure:

Standardization: As the plant was having low product variety so the use of standard procedures was very high. In our case also we are getting the value very high at 6.11 leading to a validation of our hypothesis.

Specialization: The level of the specialization was low at a value of 3.55. This is due to the requirements of very few numbers of specialized jobs in the plant as the product variety was very low. So here also we are getting a good support to our hypothesis.

Centralization: The high level of volume fluctuation lead to the rapid change in the flow-lines and hence decisions were taken at lower level. But the centralization level in the plant was found at a very high value at 5.8. Hence we are getting a very low support to our hypothesis.

Formalization: The use of the documented procedures, instructions and communications was found to be in a moderate value at 4.63. This moderate value was due to the low product variety, which lead the use of documented procedures supporting our hypothesis.

Complexity in the workflow: The level of interaction in the organization was found to be of high value, as they had to take the decisions regarding the change in the flow-lines. So in this case we are getting the level at 4.5 which is giving full support to our hypothesis.

Vertical integration: The level of vertical integration was found at a level of 65%. So they were getting a lot of the components from outside to meet the volume fluctuation, as

the plant has to depend on some parts on outsiders and this high value gives good support to our hypothesis

Vendor relations: The relationship with the vendor was of co-operative type with one to two vendors per product. But the high volume fluctuation should make the relationship competitive type. So we are getting a poor support to our case.

So from the analysis we got full support to satisfy our static **case no.2** except a low support for the case of centralization, plant and equipment and for vendor relationship.

***** So the hypothesis related to the static case number 2 revised as under:**

- 1 The plant has a very high vertical integration and hence to meet the very high in-house production they have to keep a huge amount of general-purpose machines to produce these parts. So the proportion of the general to the special purpose machines may be high.
- 2 The plant was initially a comparatively small plant without the presence of plant within plant in it, which led the decisions making at the higher authority. So the score on centralization may be high.
- 3 The plant was having very few numbers of vendors. So despite of the volume fluctuation they may have to maintain a co-operative relationship with the vendor.

FINAL OBJECTIVES:

The present manufacturing objectives of the company is as below.

Product verity:- high, delivery performance:- high, volume flexibility:- low.

This falls in the **static case S-7** of our hypothesis and to meet the above manufacturing objectives the manufacturing decisions taken by the firm is as below.

Plant and equipment's: To meet the variation of the product the plant has now opted for a lot of general-purpose machines. The ratio has now changed to 1.1 for the plant. Again the high delivery performance lead to the use of a heavy amount of buffer stock in the plant. But still they are using multiple flow lines despite of the fluctuation in the volume has now decreased to a very substantial level. So it is giving a moderate support to the hypothesis.

PPC: The high rate of product verity and the high rate of delivery performance have made the PPC a very important group in the plant. Now heavy scheduling activities are

going on in the plant and they are relying on MRP kind of material management system. On line data processing is also being very high. So this group has gained a substantial importance in the organization and giving full support to our hypothesis.

Labor skills: The high product variety has led the company to use multi skilled labor force to handle the general-purpose machines. Also the high commitment to the delivery date has made them using very highly skilled labor, hence is giving a good support to our static case.

Organization structure:

Standardization: This level decreased to a great extent as due to the presence of a high product variety and also delivery performance they have decreased the use of the standard procedures. Now it has decreased to a score of 3.88 and hence giving full support to the hypothesis.

Specialization: The plant is still not using many specialized people for the processes. The specialization level in the plant is now found at 4.1, which is a moderate value. But as there was no plant within plant so the level was remaining at a moderate value and giving a good support to our hypothesis.

Centralization: The high product variety and the high delivery performance lead to a very decentralized decision making in the organization. The lower level management making the decisions on the setup and the down time with a score on centralization 3.75, which is giving a good support to our hypothesis.

Formalization: The formalization has not changed to a very substantial level despite the high product variety and delivery performance. It is still remaining at a high level of 5.1. But the high value of the product variety and the delivery performance should make this low and hence giving a low support to us.

Complexity of workflow: There is lot of complexity in the workflow as interaction between various units has increased due to the high delivery performance and high product variety. Now it has reached to a level of 5.75 giving a very good support to the static case. 7

Vertical integration: The increase in the product variety has led the plant to use brought out assemblies and the level has decreased to 60% of the total cost. The dependence on

the vendors has increased and they are now using JIT kind of purchasing strategy But for this case the vertical integration should be low and we are getting a low support here.

Vendor relations: To meet the delivery date and the high product variety the plant is now going for a co-operative relationship with the vendor which gives support to the hypothesis

So from the analysis we are getting a good support to our hypothesis except for formalization and vertical integration So to a better extent it is satisfying our static **case no. 7.**

****** Hypothesis related to the static case 7 revised as stated:***

- 1 The plant was having a low level of use of standard procedures and hence documentation in some cases may be necessary. So the score on formalization may be of moderate value
2. Despite of the high score on dimensions of objectives the plant's in house production is high may be due to the company being a very big company of the Hero-Honda group which has sufficient fund available with them and hence they may go for a high vertical integration.

RELEVANCE TO THE HYPOTHESIS:

The following changes has occurred in the manufacturing decisions to meet the change in the manufacturing objectives in the organization:

Product verity:- low, delivery performance:- low, volume flexibility:- high →

Product verity:- high, delivery performance:- high, volume flexibility:- low.

The above change falls in the ***dynamic case D-20*** and to make the change in the objectives the plant has taken the following manufacturing decisions:-

Plant and equipment: By the analysis from the data we have found that the plant is now using a lot of general purpose machines with the proportion of general to special purpose shifted from 4:6 to 1: 1 and also carrying a lot amount of buffer stock to meet the delivery date. This shift in decisions is giving a good support to our case D-20.

PPC: Now to meet the delivery date this group has become one of the most important groups in the organization. They are paying a lot of attention to the activities like set up times and the down time. Also a high amount of on line data processing is carried out everyday So here we are getting full support to our case no. D-20.

Labor skills: Now the plant is hiring very highly skilled and multi skilled labor to meet the delivery date and to handle the general-purpose machines. A moderate amount of on line training is also provided during their tenure, which gives a good support to us.

Organization structure: -

Standardization: The level of the standardization has decreased to a very great level from 6.11 to 3.88. This decrease is due to the increase of the product variety and the delivery performance has led the organization to use non-standard procedures to meet the changes giving a good support to the hypothesis.

Specialization: - The score on specialization made a small change from 3.55 to 4.1. But it should change from high to low and hence we are getting a low support for the hypothesis.

Centralization: Now to meet the change in the product and to meet the delivery date the decisions are being taken at the lower level. The level of it has decrease from 5.8 to 4.1. So we are getting a good support that the plant has decentralized to meet the changes in their objectives giving a good support to our hypothesis for the case D-20.

Formalization: The formalization level has not changed from 4.55 to 5.1, although this should decrease with this change in the objectives. So we are getting a poor support for the hypothesis.

Complexity of the workflow: The change in the objectives has lead to the increase in complexity and increase in the interaction between various departments which lead to the increase of formalization level from 4.5 to 5.75 supporting the hypothesis.

Vertical integration:- The requirement of the outer assemblies has increased due to the increase in the product variety and the delivery performance. It has increased from a level of 30% to 40%. But the level of vertical integration remaining nearly constant giving support to the hypothesis.

Vendor relation: The relationship with the vendor has remained that of co-operative type giving a moderate support to the dynamic case as initially it should be of competitive type.

So in all the cases except in formalization and specialization we are getting a good validation to our **dynamic case of 21**. This kind of the dynamic change is very difficult to achieve and the company has done it very successfully.

***** Some modification made to the hypothesis for the case D-20 as stated:**

- 1 The use of specialized people has been decreasing in the plant may be due to the presence of a lot of special purpose machines and hence the specialized jobs are less So the score on specialization may be of low value
- 2 For the plant the use of standard procedures has been decreasing and hence they may necessitate the documentation in some cases. So the score may be of high value

Case no.6

FRONTIER SPRINGS

Frontier springs an ISO 9002 certified company, which produces helical springs only, generally for the automobile companies. They produce springs both for the use inside the country and for export purpose also. The major customers in the country are automobile giants like TELCO, Mahindra and Mahindra and MUL to name a few and are producing export quality helical springs. They are producing some 120 variety of springs depending upon the requirements of their customers

INITIAL OBJECTIVES:-

The manufacturing objectives of the production firm 6 years back was as follows:

Product variety:- high, delivery performance:- high , volume flexibility:- low .

This falls in the ***static case S-7*** and to meet the above manufacturing objectives the various manufacturing decisions taken by the organization were

Plant and equipment: The type of the machines used by the plant is mostly of general purpose machines with the ratio between the general to the special is 7: 3 in numbers. The plant was having a lot of buffer stock kept there to meet the delivery date with the customers So we are getting a full support in this case to our hypothesis.

PPC: Here also the smallness in the size of the plant restricted it to set up any formal group to do the production planning and control. They were using scheduling to meet the medium term planning and were relying on the classical kind of material management system But according to the hypothesis the group should be very important group in the organization and hence giving a moderate support to the hypothesis

Labor skills: The kind of the labor force required by the firm was mainly of the semi-skilled type with a very low amount of training provided to them. But the high product variety should make them highly proficient in their skill. So here we are getting a weak support for our hypothesis.

Organization structure:

Standardization: This level was found at a high level at 4.5. The high product variety and delivery performance gives no scope to use standard procedures. But there was presence of plant within plant, which made the plant to use, standardized procedure and we are getting a high value of standardization and supporting our hypothesis.

Specialization: The organization believes in hiring specialized people for their work as the level of specialization found to be very high at 6.11. As both the product variety and the delivery performance are high so distribution of the duties among the specialized people was very high and also the presence of the plant within plant made the value very high hence supporting our hypothesis.

Centralization: This level was found at moderate level at 4.125 due to the high delivery performance the decisions on change in the set up times and the down time were decided by the lower level management. But this moderate score gives a moderate support to our hypothesis.

Formalization: The level of the documentation in the organization was found to be very high at 6.5, but for these objectives it should be low and this value is giving a poor support to our hypothesis.

Complexity of the workflow: This value was found at a high level of 5.25 which was due to the high level of the objectives which makes a lot of interaction among the departments and makes the level very high supporting our hypothesis.

Vertical integration: The vertical integration level was found at a low level of 30% as the delivery performance and the product variety were high and hence the firm went for JIT kind of purchasing technology. The low level of the vertical integration gives a good support to the hypothesis.

Vendor relation: The relationship with the vendor was found to be of competitive type and an average of more than 4 vendors for a particular product. But for these objectives the relationship should be of co-operative type and is giving a poor support to hypothesis.

So from the above analysis we had found that it has a partial relevance with the **static case no.7** with a low support in the case of labor skills, formalization and vendor relationship

*****Hypothesis related to the static case S-7 revised as under:**

1. There is no explained cause for this kind of deviation from the original hypothesis for formalization and labor skills So this is a special case and the score may remain high
2. The plant was having 4 vendors per product So for this high number of vendors they have got alternatives in vendor selection and hence may maintain a competitive relationship with the vendor This will probably enhance profitability of the company.

FINAL OBJECTIVES:-

The present manufacturing objectives of the firm is as given.

Product variety:- high, delivery performance:- high, volume flexibility:- high.

The above strategy matches with the **static case S-8** and to match the change in the manufacturing objectives of the firm the manufacturing decisions taken are as given below

Plant and equipment: The ratio between the general to the special purpose machines in numbers is now 3.1. They are still keeping a lot of buffer to meet the delivery date with the customer. So this data gives full support to the hypothesis.

PPC: This group has gone a lot of changes with the firm still relaying on scheduling of the activities for the medium term planning. They have changed their inventory management system to MRP kind of system to meet the variation in the volume So here we are getting a very good support to the hypothesis

Labor skills: The type of labor required by the firm is now of moderately skilled. But now they are providing a moderate amount of training to them to meet the variation in the product. But to match all the objectives at their maximum level the work force should be very highly skilled and hence we are not getting a good support for the hypothesis

Organization structure:

Standardization: This level has gone up to 68, which is a very high value due to the presence of plant within plant in the organization and hence is satisfying our hypothesis

Specialization: Here also the concept of plant within plant played a vital role in the organization and hence the plant is still hiring very specialized people for their work. From the data we have found the specialization level was 6.55 which is very high value matching with our static case no 8.

Centralization: The centralization level in the plant is still remaining at a moderate level at 4.125 as many of the decisions still are taken at the higher level management. But the plant within plant concept should make it decentralized decision making and hence giving a moderate support to our hypothesis.

Formalization: The level of documentation in the organization is now at the peak level at a value of 7.0. But the high product variety should not make it possible to document everything. So it is a special case and not relating to our static case.

Complexity of the workflow: As all the three objectives are at their peak level so the interaction between different departments in the organization increased to a great extent and made the level as high as 6.25 and is giving a very good support to our hypothesis.

Vertical integration: The vertical integration level in the organization is now at 30% as some less value is added within the company to meet the change in the volume. Also the purchasing strategy is now of JIT kind and we are getting good support for this case.

Vendor relation: The number of vendor has increased to 4 with the relationship is of co-operative type with the vendor so we are getting a very good support in this case also.

So from the above analysis we have found a special type of company where the concept of plant within plant arises. And based on this the decisions taken are matching with the **static case no.8** except for the case of labor skills and the formalization.

***** Hypothesis related to the static case S-8 revised as stated:**

1. Despite of high objectives the smallness in size and the scarcity of fund restricted the plant to hire multi-skilled labor. So the labor force may be low and moderately skilled for this case.
2. Here also the high score on formalization is an unexplained kind of deviation from our original hypothesis and hence no changes have been made to the hypothesis.

RELEVANCE WITH OUR HYPOTHESIS:

The plant had gone through the following change in the objectives :

Product variety:- high, delivery performance:- high , volume flexibility:- low →

Product variety:- high, delivery performance:- high, volume flexibility:- high.

The above change falls on the *dynamic case D-8* and the changes in the manufacturing decisions made by the plant are as follows

Plant and equipment: No major change has occurred in this segment with the ratio of the general to special purpose machines increased from 7.3 to 3:1 due to a little change in the product variety. But they are not using flow-lines to meet change in volume and giving a moderate support to the hypothesis.

PPC: This group has also gone through certain changes with the material management system has been changed from classical to the type of MRP kind of system. But still they are using scheduling for the medium term planning. This change gives moderate support to the hypothesis.

Labor skills: The kind of labor force required by the firm has gone through a minute change with changing from semi to a moderately skilled type and the training provided is now moderate. So this gives a very good support to the hypothesis.

Organization structure:

Standardization: This level had changed from a moderate 4.5 to as high as 6.8. This high use of the standardized procedure is due to the presence of the plant within the plant hence supporting our hypothesis.

Specialization: The level of the use of the specialized people in the organization is very high as there is a concept of the plant within the plant so the level has changed from 6.11 to 6.55, and this small change supports the hypothesis

Centralization: The plant is moderately centralized with the level remaining constant at 4.125. To meet the demand of delivery date and the change in the volume most of the decisions are taken by the lower level management. So we are getting a moderate support here for the hypothesis

Formalization: The documentation of the procedures in the organization has increased from a level of 6.5 to 7.0. But the high product variety will not make it possible to use all the documented procedures and hence we are getting a low support to our hypothesis

Complexity of the workflow: The interaction among the departments has increased a little bit to meet the change in the volume. It has changed from 5.0 to 6.25 and this high value is due to the decisions taken on the change in the set up time and down time where there will be a lot of interaction among the departments

Vertical integration: The level has changed from 20% to a little higher of 30% as to meet the variation in the volume. But this change can be thought as negligible and giving a good support to our hypothesis

Vendor relation: The relationship with the vendors the firm keeping is still is of competitive type and pursuing a JIT kind of purchasing strategy. So here also we are getting a very good support to our hypothesis

So from the above analysis we have found a relevance to the **dynamic case no.8** with a low support in the case of formalization of the organization structure. But this kind of change is very easy to achieve and no drastic change required in any of the manufacturing decisions as evident from the analysis of our data

****** Hypothesis related to the dynamic case D-8 has been changed as below:-***

- 1.*** Despite of the high objectives the documentation of procedures is high due to the smallness in the size of the plant and hence score on formalization may be high

Case no.7

CAWNPORE WOOLEN MILLS

Cawnpore woolen mills, a government enterprise was set up in the year 1876 by the British government for manufacturing blankets only. It used to manufacture blankets for the defense purpose only. During the Second World War it had gone through a mass modernization and became a pioneer in manufacturing woolen garments. But in the late 60's due to heavy competition its share started falling. Also due to being a government company it had to work with the same machinery and equipment. But now to compete with the market the company has started manufacturing shawls, suiting material and other material for the government use. The company produces 70% of the goods for the government use and 30% for the civilian use.

INITIAL OBJECTIVES:

The manufacturing objectives of the company 7 years back was.

Product variety: - high, delivery performance: - high, volume flexibility: - high.

The above case falls in the *static case S-8* of our hypothesis. To meet these objectives the manufacturing decisions taken by the firm are as below

Plant and equipment: Majority of the type of machinery used by the plant is of general-purpose type with the ratio of general to special purpose machines in numbers is 6. 4 This use is due to the high product variety Also they were keeping a heavy buffer stock and using flow-lines for their manufacturing. So this data gives a good support to the hypothesis

PPC: This group was having a lot of importance in the organization with scheduling is used for the medium range planning. Also they were going for the JIT kind of material management So here we are getting a good support to our hypothesis

Labor skills: The kind of labor force recruited by the company was of semi skilled type with a low training provided to them. So here we are getting a very low support for our hypothesis.

Organization structure:

Standardization: - The level of standardization was found at a high score of 5.0. Despite of all the objectives at their peak the plant is still using standard procedures due to the presence of plant within plant as they are producing different clothing. So this gives a very good support to the static case 8.

Specialization: - The plant had a very high distribution of the official duties with the score of specialization at a high value of 4.77 supporting our hypothesis.

Centralization: - The decision-making authority in the organization was found at a score of 4.03. The high objectives should make a lot of delegation of the authority and the score should be low. So the moderate score on centralization is giving a moderate support to our hypothesis

Formalization: - The use of the documented procedure was found to be high at 4.26 But the low product variety should make this score at a low value and hence we are getting a moderate support for this case

Complexity of the workflow: - There was a moderate level of interaction between the departments with a score of 4.0 But the high product variety it should be very high and hence we are getting a moderate support for this case.

Vertical integration: The in-house production in the organization was found to be of moderate value with 60% of the value added inside the company The reason being the high product variety and volume flexibility will make the value low but on contrary the high delivery performance will keep the value at a moderate level supporting our hypothesis

Vendor relation: The relationship with the vendor was found to be of competitive type with an average of 3 vendors per product But for these objectives the relationship should be of competitive type and hence it is giving a low support to the hypothesis

So from the above analysis we have found the data giving a low support for the case of labor skills and vendor relation and good support for the other cases.

***** The hypothesis related to the case S-8 revised as stated: -**

- 1 Despite of the high objectives there were some constraint in the organization like they have stopped recruiting labor due to government policy and were managing with the old labors which was of semi-skilled So the labor force may be of semi skilled type.
2. The plant was having high of all the objectives The delivery performance makes it co-operative and the high volume fluctuation necessitate a competitive relationship For this case the company gives more importance to the volume flexibility and hence the vendor relationship may be of competitive type

FINAL OBJECTIVES: -

The present manufacturing objectives of the company was as follows

Product variety: - low, delivery performance: - high, volume flexibility: - low.

The above case falls in the *static case S-5* and to meet these objectives the manufacturing decisions taken by the firm are

Plant and equipment: - Major changes had occurred in this sector with the plant now having the ratio of general to special purpose machines being 30 70 to meet the demand of low product variety Also the firm is now not using any flow lines. So these data are giving a good support to the static case number 5.

PPC: - This group has also lost some of its importance due to the low product variety and volume flexibility. The plant is now using build up or run down of the inventory for the planning. But they are using MRP kind of material management system for the inventory management. So this group is having a moderate importance, supporting the hypothesis.

Labor skills: - The type of labor now hired by the firm is of moderate skilled with a moderate training provided to them. As the product variety is low so the need for multi skilled labor is low so it is supporting the hypothesis.

Organization structure: -

Standardization: - The low product variety led to very high use of standardized procedure making the score of standardization high at 4.55 supporting the hypothesis.

Specialization: - The level of use of specialized people in the organization has decreased due to low distribution of work to meet the low product variety. So the score has decreased to 3.55 fully supporting our hypothesis.

Centralization: - The decision making authority is now in the hand of higher authority although some decisions still are taken by the lower level management to meet the performance on delivery date. So the moderate score of 4.67 gives a good support to us.

Formalization: - This score was found at 4.0, which is a moderate value. But in this case it should be high and hence giving moderate support to the static case.

Complexity of the workflow: - The interaction level in the organization is presently at a moderate value of 4.0, which gives a moderate support to the hypothesis.

Vertical integration: - The in-house production of the company is now 50%. The low product variety and high delivery performance should enhance more in house production. So this value is giving a low support for the hypothesis.

Vendor relation: - The low dependency on the vendors is due to the high vertical integration, which should lead to co-operative relationship. But here we are having a competitive relationship giving a low support to our hypothesis.

So from the above analysis we have found that we are getting a low support for the case of vertical integration and vendor relation and good support for all the other cases. So the data fully satisfies our hypothesis with certain changes made to it.

***** Hypothesis related to the static case 5 revised as stated:**

- 1 Despite of the high product variety and delivery performance the major constraint with the plant is that being a sick firm it is not able to get enough funds from the government. So in-house development of all the parts is not possible and hence the vertical integration may be low
- 2 As the vendor relation is more dependent on the vertical integration rather than on the manufacturing objectives so the low vertical relation may force the firm to have a competitive relationship with the vendor.

RELEVANCE TO OUR HYPOTHESIS: -

The plant had gone through the following changes in their objectives since the last 7 years

Product variety: - high, delivery performance: - high, volume flexibility: - high →

Product variety: - low, delivery performance: - high, volume flexibility: - low.

The above change falls in the ***dynamic case D-26*** of our hypothesis. To meet the above changes the plant has changed the manufacturing decisions in the following way: -

Plant and equipment: - To meet the change in the product variety from high to low the plant had reduced the proportion of general to the special purpose machines from 4:6 to 7:3 But they are still keeping huge buffer to meet the delivery date and all these changes supporting our hypothesis

PPC: - This group has lost its importance with the change in the objectives. The plant is now not using any strong scheduling activities. So here also we are getting a good support for the case D-26.

Labor skills: - No change has occurred in the type of labor recruited by the firm with the type still are of low skilled So here we are getting a low support to the hypothesis.

Organization structure: -

Standardization: - This score changed from 5.0 to 4.55, which is a very minute change and this high value is due to the presence of plant within plant and is supporting the hypothesis.

Specialization: - The score has changes from 4.77 to a low 3.55, which is due to the lesser need of specialized jobs for meeting the low product variety. So here also we are getting good support for the case D-26

Centralization: - It changed from 4.0 to 4.67 due to the decrease in the product variety and hence more decisions are now taken at higher level supporting our hypothesis

Formalization: - The score had changed from 4.26 to 4.0 which is a negative change although it should increase as the low product variety will enhance the use of documentation. So it gives a low support to the hypothesis.

Complexity of the workflow: - This score remained almost constant with a minute change from 3.75 to 4.0. So it is giving a moderate support to our dynamic case.

Vertical integration: The percentage of in-house production has gone through a minute change from 60% to 50%. So this is a small change which we can ignore and hence we are getting a moderate support for the hypothesis.

Vendor relation: The relationship with the vendor is remaining of competitive type, which is giving a very poor support to our hypothesis.

From the above analysis of the data for the dynamic case we are getting a low support for the case of labor skills, formalization and vendor relationship and good support for all the other cases. So it is giving a good support to our *dynamic case D-26* with certain changes made to it. This kind of change is difficult to achieve.

***** Hypothesis related to the dynamic case D-26 revised as stated.**

- 1 The plant is a government run organization and hence they have to follow the policy set up by the government as per labor force requirements is concerned. So despite of the change in the objectives they were not able to change the type of labor in the firm. So the labor force may be of semi-skilled type for this case.
- 2 Despite of the high objectives the plant being a government run organization so they have to use all the documented procedures and hence the score on formalization may be found to be high.
- 3 As stated for the static case the vendor relation is dependent on the vertical integration and hence the plant has to have a competitive relationship with the vendor to match with the vertical integration.

Case no.8

INDAL- HIRAKUD

INDAL, the first ever aluminum producer in India and the first ever fully integrated aluminum plant in Asia has set up its plant with collaboration with the ALCAN group of Canada. A total of 11 plants all over India and in the Hirakud plant they are having a melting section to produce aluminum slabs of size 2 ton, 2.5 ton, 3 ton and ingots of size 20kg. With that they have a carbon plant to produce coke for the internal use and for export purpose.

INITIAL OBJECTIVES:

The initial manufacturing objectives of the plant around 8-year back was as

Product variety:- low, delivery performance:- high, volume flexibility:- low.

This falls in the *static case S-5* and to meet the above requirements the plant had to make the following decisions around 8 years' back.

Plant and equipment: The plant is an aluminum plant and hence had a very low variety in the product. Hence most of the machines used are of the type special purpose with the ratio between the special to the general-purpose machines was of 3:1 in numbers. Also to meet the delivery requirements they were having a lot of buffer stock in the raw material section. So this analysis is matching to our hypothesis.

PPC: This is the group of the people to schedule the activities. As it is a very small plant, there was no special group to handle the activities. They were using classical approach of the material management system with a very low on line data processing. This group was having a moderate importance in the organization and hence matches with the hypothesis.

Labor skill: The labor force in the firm was mostly of low skilled type. The reason is that due to the low product variety the plant is having low skilled labor. The on line training provided to them is also very low. So here also we are getting a very good support to the static case 5.

Organization structure:

Standardization: The level of standardization in the organization was moderate value at a score of 4.22. The low product variety should make it very high, and hence is giving a moderate support to our hypothesis.

Specialization: The level was very low at a value of 3.88. The low level of specialization was due to the low product variety and the departmentalization is very low so the use of the specialized people is very limited. So it is giving a good support to the hypothesis.

Centralization: The centralization level 5 to 7 years back was very high at 5.75. This is a very high value although the high level of the delivery performance should make the procedures de-centralized and hence is not matching with our hypothesis.

Formalization: At an initial level of 4.42 the formalization level is at a high value. As the product variety is low so it will be possible to document all the procedures and the communications and hence will keep the score high. So this also gives a good support to us for our static case.

Complexity of the workflow: This value was found to be at a low level at 3.75. As the product variety is low so the interdepartmental interaction should be very low and we are finding a low score which supports the hypothesis.

Vertical integration: The level of the vertical integration was found to be at a level of 60%. This high value was found due to the low product variety and volume fluctuation and hence we are getting a good support for the hypothesis.

Vendor relation: The firm was having 3 to 4 vendors for their major products. The firm was having a competitive relationship with the vendor although the hypothesis states a cooperative relationship for these objectives. So here we are getting a poor support for the hypothesis.

So from the analysis we have found that except for the case of centralization and vendor relationship all the other manufacturing decisions have relevance to our hypothesis. So it is satisfying to our **static case no. 5** with certain revisions made to it.

*****Hypothesis under static case number 5 revised as below:**

1. Despite of the high delivery performance there was very low distribution of hierarchy in the plant due to the small size of it. The higher level management took so most of the decisions and hence the score may be found at a high value.
2. Despite of the high delivery performance the vertical integration was also very high. So for this low dependence on the vendors the plant may go for competitive relation.

FINAL OBJECTIVES:-

The present manufacturing objectives of the firm is as follows

Product variety:- low, delivery performance:- high, volume flexibility:- high.

These objectives are matching with the *static case S-6* of our hypothesis and to meet the objectives the manufacturing decisions taken by the firm are as follows.

Plant and equipment: Most of the machines they are using are of the special purpose type But now to meet the fluctuation in the volume the plant has started the use of the flow-lines and hence supporting our hypothesis

PPC: The PPC is a very important activity in the plant Now after increasing in the fluctuation in the volume they have started using the MRP kind of system plus a very high level of the on line data processing. But the low level of product verity should make it a moderately important group in the organization So here we are getting a moderate support to the hypothesis.

Labor skills: The labor force used by the firm presently is of moderate type with the low training provided to them. So this is also supporting the hypothesis

Organization structure:

Standardization: The present level of standardization is found to be 4.2, which we can consider to be a moderate value But the low product variety should make it a very high value So we are getting moderate support in this case

Specialization: The level of the specialization is now 5.8, which we can say as a high value But the low product variety will lead to the use of less specialized people for the organization So here also it is not matching to our hypothesis

Centralization: This level is now found to be at 5.2 which shows that a very highly centralized decision making is going on in the plant But the high nature of volume fluctuation and the high delivery performance should make the decisions like the change in the setup time etc. to be taken at the lower level management. So this gives a very weak support to the hypothesis.

Formalization: The present level of the formalization is found to be at 5.7 which is of very high value as the product verity is low so all the documented procedures are used in the organization and hence giving support to us

Complexity in the workflow: Due to the low product flexibility the interaction between different departments should be low which we are finding at a score of 3.75 and hence supporting to the hypothesis.

Vertical integration: The final level of vertical integration has increased to a level of 70%. As the level of the product variety is low so the in-house production will be of high value, but the volume fluctuation will keep at a moderate level giving support to the hypothesis.

Vendor relation: Presently also the firm is going for a competitive relationship with the vendor giving a low support to the hypothesis.

So from the above analysis we are getting support to the **static case S-6** of our hypothesis except for the case of specialization, centralization and vendor relationship.

*****Hypothesis for the static case number 6 revised as stated:**

1. Despite of the low product variety the other two objectives are high. So the plant may need specialized jobs for higher efficiency. So the score on specialization may be high for this case.
2. Despite of the high delivery performance and volume fluctuation the smallness of the size of the plant compels the top management to take all the decisions. So the score of centralization may be low.
3. For the case of high delivery performance the plant will go for co-operative relationship and for a high volume fluctuation and high vertical integration it will be of competitive type. So here the volume fluctuation may bear more importance for the plant hence the relationship with the vendor may be of competitive type.

RELEVANCE TO THE HYPOTHESIS:-

The plant has made the following transactions during a period of 8 years

Product variety:- low, delivery performance:-high, volume flexibility:- low →

Product variety:- low, delivery performance:- high, volume flexibility:- high.

The above change falls in the **dynamic case D-7** of our hypothesis and to match with the dynamic changes the change in manufacturing decisions are as:

Plant and equipment: As seen from the data we found that no substantial changes have occurred in the plant and equipment as the product variety is remaining low. But with the

increase in the volume flexibility they have now implemented the flowlines. So here we are getting a good support to our hypothesis

PPC: The PPC group in the plant formally set up and were playing an important role for the plant. They are relying strongly on MRP kind of material management system. Also the on line data processing has shifted from a low level to high. So here we are not getting a match with the hypothesis

Labor skills: No substantial change has occurred in the type of labor in the plant. As the plant is of a comparatively small manufacturing unit and the product variety is at low level so the labor type has shifted from a level of low to a moderately skilled type. So this change in the labor type is giving a good support to the hypothesis

Organization structure:

Standardization: The level of standardization has not changed to a very substantial level in the organization and remaining constant at 4.2. As the product variety is remaining low so the plant is not making any change in the use of the standardized procedures and hence giving support to our hypothesis.

Specialization: This level that is the level of the use of the specialized people in the plant has changed from 3.88 to 5.8. Although there is only a change in the volume fluctuation in the plant. So this drastic change is not supporting our case

Centralization: With the change in the level of volume fluctuation the score on centralization changed from 5.75 to 5.2 as some more decisions are now taken at the lower level. Still its high score gives a moderate support to the hypothesis.

Formalization: This is the level of the use of the documented procedure in the organization and has changed from a level of 4.5 to 5.7. So the documentation is increasing although it should decrease due to the increase in the volume fluctuation. So we are not getting a good support here

Complexity of the workflow: The interaction level in the plant has remained at 3.75. The low interaction is due to the low variation in the product and we are getting support to our hypothesis.

Vertical integration: The level has changed from 60% to 70%. So this change in the level can be considered as negligible and hence we are getting full support in our hypothesis.

Vendor relation: The plant has maintained a competitive relationship with the vendor although it should be co-operative for this case and hence giving a low support to the hypothesis

So from the analysis we have found low support for the case of specialization and vendor relationship and a good support for all the other cases and hence we can conclude that this is a good match with the **dynamic case number D-7**. This change is a very easy kind of change to occur and the plant had successfully done it.

******Hypothesis under dynamic case D-7 revised as stated below:***

- 1 Despite of the low product variety the other two objectives are high and hence the plant may need more specialized jobs. So the score on specialization may be high
2. The plant was having both high delivery performance and volume flexibility so for the delivery performance they should go for cooperative and for meeting volume fluctuation the relationship should be competitive. So here volume fluctuation may bear more importance and they may go for a competitive relationship with the vendor

Case no.9

PEPSI-CO

Pepsi cola, one of the major manufacturers of soft drinks and snack chips in the global market had established itself in the year 1888 and is now the second largest soft drinks manufacturer in the world after Coca-Cola. The major products of the company include Pepsi, Miranda, 7UP in the soft drink sector. It has started its venture in the Indian sector in the year 1989 and now became the largest soft drinks manufacturer with a heavy share of around 60% in the Indian market.

INITIAL POSITION:

The initial objectives of the company 5 to 7 years' back was

Product variety:- low, delivery performance:- low, volume flexibility:- high.

The above case falls in the **static case S-2** of our hypothesis and to meet the above objectives the organization had taken the following manufacturing decisions:

Plant and equipment: The plant that we had visited was only a soft drinks manufacturer so it was having a low product variety and hence has only special purpose machines for

making soft-drinks. Also the low delivery performance led the plant to have a very low buffer stock. So it is giving a good support to our hypothesis.

PPC: The company has a very low product variety and low delivery performance and hence the group was not having much importance in the organization. To meet the variation in the volume they are relying on increase or decrease in the number of shift or workers. They were relying on the classical approach of inventory control so here also we are getting a good support to our static case.

Labor skills: As both the product variety and the delivery performance was low so the management had hired un-skilled labor with a very low training provided to them as they had to handle only the special purpose machines and hence supporting the hypothesis.

Organization structure: -

Standardization: The score of standardization in the plant was 5.68, which is a very high value as due to the low value of the product variety use of standard procedures was high and hence is giving a good support to our hypothesis.

Specialization: This level was also found to be very high at 5.34. But the low product variety will make the value very low, as the need for the specialized people will not arise. So the high value gives a very low support to our hypothesis.

Centralization: The high volume flexibility had made the decisions on the change in the flow lines to be taken at the lower level and there was a lot of delegation to the authority. But also the low delivery performance will make some power in the hand of the upper level management and the moderate score on centralization at 3.56 gives a good support to the hypothesis.

Formalization: The score on formalization was found at a moderate value of 4.5, although the low product variety will necessitate the documentation of all the procedures and hence it is giving a moderate support to our hypothesis.

Complexity of the workflow: As stated the moderate interaction due to the volume flexibility made the complexity level somewhat moderate at 3.75. But it should be in a high value and hence is giving a low support to our hypothesis.

Vertical integration: The high level of volume flexibility should make vertical integration very low. But here we are getting a high value of 65% value addition inside the company, which gives a poor support to the hypothesis.

Vendor relation: The plant was going a competitive relationship with the vendor with average 3-4 vendors. So the high volume fluctuation necessitates this kind of relation with the vendor and hence giving a very good support to the hypothesis.

So from the above analysis we have found that except for the case of specialization, complexity of the workflow and for the case of the vertical integration. So the analysis gives us a good support to the **static case S-2**.

***** Hypothesis related to the static case number 2 revised as stated:**

- 1 Although there was variation in volume but the plant was having a very low product variety and delivery performance and hence the interaction between different departments may be low and hence the score on complexity on workflow may be low for this case.
- 2 As stated the plant is a soft-drinks manufacturer and hence did not need any outside value addition to the final product except for the raw material. So the level of vertical integration may be high for this case.

FINAL OBJECTIVES:

The present manufacturing objectives of the company is as follows

Product variety:- low, delivery performance:- high, volume flexibility:- high.

The above objectives falls in the **static case S-6** and to meet the above objectives the decisions taken by the plant are as below:

Plant and equipment: The low product variety makes the plant use a large no of special purpose machines. But the high delivery performance made the plant to keep a huge amount of safety stock in advance and is giving support to the hypothesis.

PPC:- Now this group has gained some importance in the organization. Although they are not using any tight scheduling procedure but were seriously decreasing the down time and the machine set up time. So this group has now gained a moderate importance in the organization and giving support according to our hypothesis.

Labor skills: The labor force hired by the company is still of moderate kind with a low on line training provided to them, as they have to handle repetitive kind of job and hence supporting our hypothesis.

Organization structure:-

Standardization: The level of standardization still remains at a very high value at 5.25. As the product variety is still low so the plant is still using the standard procedures. So we are getting a good support for the case of standardization.

Specialization: The final value of the specialization level is 5.12. It is still remaining high although the low level of the product variety should make it very low and hence giving a low support to our hypothesis.

Centralization: The centralization level is now at 4.25. But the high delivery performance and the high volume flexibility should make the plant decisions very highly decentralized. So the moderate value is giving a moderate support to our hypothesis.

Formalization: the level of the use of the documented procedures still remains at a moderate value at 4.42. The reason may be due to the fluctuation in the volume and high delivery performance the documentation may not be possible in some of the cases but the low product variety makes the documentation in all the other cases. So it is also giving a moderate support to our static case.

Complexity of the workflow: The value has become 5.5, which is a high value although the low product variety will not necessitate any interaction and hence we are getting a low support for this case.

Vertical integration: The vertical integration still remains at high with a value addition of 80%. So here we are getting a deviation from our original hypothesis.

Vendor relations: As stated above although the delivery performance and the volume fluctuation both are very high but the value addition is inside the company. But now they have established a co-operative relation with their vendors. So this is giving a good support to us for our hypothesis.

So from the analysis of the found data we are getting a weak support for the case of and for the vertical integration. For all the other cases we are getting full support for the **static case 6**.

******Hypothesis related to the static case 6 revised as stated:***

1. Despite of the low product variety the high delivery performance and the volume fluctuation may need more specialized jobs in the plant and the score on specialization may be high.

- 2 Based on the same logic to meet the high volume flexibility and delivery performance the plant may need more interactions among the departments. Also the high vertical integration led to more interactions and complexity of the workflow may be high.
- 3 Despite of the high dimensions in the objectives the in-house production in the plant is very high as it is a soft drink manufacturing plant and hence may not need any outside value addition So the level of vertical integration may be high.

RELEVANCE WITH THE HYPOTHESIS:

The organization has gone through the following changes in their manufacturing objectives during a period of 7 years:

Product variety:- low, delivery performance:- low, volume flexibility:- high →

Product variety:- low, delivery performance:- high, volume flexibility:- high.

The above case falls under *D-3* of the hypothesis and to make the above changes the change in the manufacturing decisions in the organization are as follows:

Plant and equipment: As the product variety has remained at a low value so the plant has been using a lot of special purpose machines But the high delivery performance has led the plant to increase the buffer stock to meet the delivery date. So it is giving support to our hypothesis

PPC: This group has also changed from a low profile to a moderately important group in the organization as to meet the delivery date they had to reduce the set up time and the downtime. So the group gained some importance and is giving support to our hypothesis

Labor skills: Not much change has occurred in the type of the labor that has been hired by the firm. The low product variety doesn't necessitate the use of multi skilled labor in the organization So this also gives a support to our dynamic case.

Organization structure:

Standardization: The level of the standardization has decreased from 5.68 to 5.25. So there was a reduction in the use of standard procedures as due to the increase of the delivery performance to a high value so they have to change their procedure So this minute change gives a good support to our hypothesis

Specialization: This value has also decreased from 5.34 to 5.12. So no drastic change is occurring in the case and hence we are getting a good support to our hypothesis.

Centralization: This level has increased from 4.25 to 4.36. This slight increase is due to the increase in the delivery performance so they have de-centralized the process. It is remaining high due to both the delivery performance and volume flexibility at their highest stage. So here also we are getting a good support to our case.

Formalization: The level has increased from 3.75 to 4.42. But the level of documentation should remain constant and hence we are deviating from the original hypothesis.

Complexity of workflow: This level has also increased from 3.75 to 5.5. The interaction has increased due to the delivery performance. But it is not supposed to change so drastically. So it also is giving a low support to our hypothesis.

Vertical integration: The level of vertical integration has not changed to a substantial level although the delivery performance and the volume fluctuation at their highest level. It has shifted from 65% to 80%. But they have not changed the type of purchasing strategy and we are getting a low support for the vertical integration.

Vendor relation: The relationship with the vendor has remained that of co-operative type and no change has occurred with the relation with the vendor. So it also is giving a low support to us.

So from the above analysis we are getting poor support for cases like structure, vertical integration, vendor relation etc. and good support for the other decisions areas. So overall we can say that it is moderately satisfying our **case no. D-3**. This kind of the change is very easy to achieve and the company has successfully done that within a span of 7 years.

***** Hypothesis related to the case D-3 revised as stated:**

1. The increase in the delivery performance may enhance an increase in the level of interaction among the departments. So the score on complexity of the workflow may be found very high for high delivery performance and volume flexibility.
2. As stated earlier the plant being a soft-drink manufacturer has to procure only the raw material and other value addition is done inside the company. So the level of vertical integration may become high for this kind of company.

Case no.10

EVERADY INDUSTRIES LIMITED

Eveready industries is one of the prime torch and battery manufacturer in India. Set up in the year 1958 by a MNC group the company is having a total of 11 plants all over India. It was taken over by the Khaitan Group of Industries. In their Luknow plant they are manufacturing only flashlights of different specifications

INITIAL OBJECTIVES:

The initial objectives of the company seven years back was of the type

Product variety:- high, delivery performance:- high, volume flexibility:- low.

This objective falls in the *static case S-7* of our hypothesis and for reaching the objectives the manufacturing decisions taken by the firm was as follows:

Plant and equipment: - The plant was having a lot of special purpose machines with the ratio between the special to the general purpose machines in numbers was 7: 3 and most of the machines are of special purpose type. But the amount of the buffer stock kept by the firm was very high to meet the delivery performance. They were having a FMS kind of setup to meet the high value of the both product variety and delivery performance. So we are getting a good support to our hypothesis in this case.

PPC: -This was also a very important activity for the plant with 15 people was there in the PPC group to handle all these activities. They were using scheduling of the activities with the MRP kind of material management system there. This group was a very important group for the organization, which is fully supporting our hypothesis

Labor skills: The kind of the labor force hired by the firm was of the semi-skilled type with a moderate amount of training provided to them. But for a high product variety the labor force should be highly skilled hence it is not matching with our hypothesis.

Organization structure

Standardization: This score was found to be 5.22, which shall be considered as a high value. But the high product variety should keep the use of the standardized procedure in the organization very low and also there was no plant within plant in this organization. So this is not supporting our hypothesis

Specialization: The use of the specialized people in the plant was found to be very high at a score of 6.11. The high product variety will make the distribution of the official duties very high and is giving a very good support to our hypothesis.

Centralization: The level of the decision making authority was very low at a score of 3.6, which was due to the presence of the high product variety and delivery performance so delegation of the authority was very high giving a very good support for our hypothesis.

Formalization: The documentation of the procedures and instructions was found very high at 5.2. But according to the hypothesis it should be low due to the low product variety and giving a low support to the hypothesis.

Complexity of the workflow: This score was found at a high value of 5.0, which was due to the high product variety, which made a lot of interaction between the functional units. So here also we are getting a good support to the static case.

Vertical integration: The in-house production in the plant was low with the value addition is of 40% of the total value. So this low vertical integration is giving a very good support to our hypothesis.

Vendor relation: The plant was having a co-operative relationship with the vendor with 2 vendors for a particular product. The high product variety and delivery performance made the plant to use JIT kind of purchasing strategy. So it matches fully with our hypothesis.

From the above analysis we are getting a good support for the static case 7 except for the case of labor skill, standardization and formalization.

*****Hypothesis related to the static case number 7 has been revised as stated:**

1. Due to the use of a lot of special purpose machines, the labor forces had to handle only those machines and hence they may be of lowly skilled types.
2. No specific reason is found for the high score on formalization and standardization. So it is an unexplained deviation from the original hypothesis.

FINAL POSITION:

Present manufacturing objectives of the organization was found to be of the type

Product variety:- high, delivery performance:-high, volume flexibility: high.

These objective matches with the ***static case number 8*** of our hypothesis and to meet the objectives the manufacturing decisions taken by the firm were as follows:

Plant and equipment: There was no change in this sector. They are still using a lot of special purpose machines with the ratio between the general to the special purpose machines still remaining 3 7 But now the plant has started to use flow-lines to meet their change in volume So here we are getting a partial support to our hypothesis

PPC: This group has a lot of importance in the plant with they are using scheduling activity for their medium range planning Also they are going for the MRP kind of material management system So these data gives a very good support to the static case 8

Labor skills: The kind of labor recruited by the firm are of semi skilled type with a moderate amount of training provided to them But to meet the high product variety and delivery performance the workforce are supposed to be highly skilled and hence we are getting a very low support for this case.

Organization structure:

Standardization: The level of the use of standard procedure in the organization was found to be at a high value with a score of 5.22. But the high objectives should make it to use only non-standard procedures and also as there was no concept of plant within plant and hence we are getting a deviation from our hypothesis

Specialization: This score was found at a very high value at a very high level at 6.11 This is a very high value and as the objectives are at their highest level so a lot of specialized people are there in the organization and we are getting a very good support in this case.

Centralization: The decision making authority in the plant for the lower level management is very low at a score of 3.6 The lower management takes most of the decisions like any change in the set up time or down time and it gives a very good support to our hypothesis.

Formalization: The use of documented procedure in the organization was very high at a score of 5.2, although the high objectives should make it low hence giving a poor support to our hypothesis.

Complexity of the workflow: There is a lot of interaction among various functional departments due to the high product variety. So we are getting a high value of the complexity at 5.0 and are getting a good support for our case.

Vertical integration:- The in-house production in the plant is now 50% which gives half of the value added in the company and dependence on the vendor very high. Again the high volume fluctuation made the plant to bring 20% assemblies from outside. So here we are getting a good support to our hypothesis.

Vendor relation: The relationship with the vendor is of co-operative type and the plant is now going for the JIT kind of purchasing strategy. As the product variety and delivery performance are both high so they are making a very good relation with the vendor. So this is also giving a very good support for our case.

So by analyzing the data we have found a good relevance with the static case *S-8* for all the manufacturing decisions except a low support for labor skills, formalization and standardization.

***** The hypothesis related to the static case 8 has been revised as stated:-**

1. Despite of high objectives the use of many special purpose machines may compel the plant to have only moderately skilled labor to handle these machines.
2. Despite of the objectives being high the need to control may necessitate the use of standard and documented procedures and the scores may become high.

RELEVANCE WITH THE HYPOTHESIS:

The plant has gone through the following change in their objectives during the past 7 years:

Product variety:- high, delivery performance:- high, volume flexibility:- low→

Product variety:- high, delivery performance:-high, volume flexibility: high.

This falls in the category of *dynamic case number D-8* and for reaching this change the plant had made the following changes in their objectives:

Plant and equipment - This has gone through a minute change with the plant now started using multiple flow-lines to meet the demand in change in volume. So this is giving support to the assumption in the hypothesis.

PPC:- This group has not gone through any changes and is still remaining a very important group for the organization. So we are getting full support for this case also.

Labor skills: The type of labor force in the organization still is of semi-skilled type and not gone through any change. So it also gives a good support for the dynamic case.

Organization structure:-

Standardization: This score is remaining constant at 5.22 This should remain at a low value but by not going through any changes it is supporting to the dynamic case of our hypothesis

Specialization: The use of the specialized people in the organization is very high at a level of 6.11 So we are getting a good match with the hypothesis.

Centralization: The level should decrease to a certain extent, as the volume fluctuation will necessitate certain decision taken at the lower level So here it is remaining at the same level of 3.6 so we are getting moderate support here for the hypothesis

Formalization: The use of documented procedure in the organization is remaining constant and hence giving support to our case

Complexity in the workflow: the interaction level is at 5.0 and is remaining constant, which gives a very good support to the hypothesis.

Vertical integration: Certain change has occurred in the vertical integration level with the value addition increasing from 40% to 50% now Also the assemblies brought from outside is now 20% to meet the change in volume So here also we are getting a good support for D-8

Vendor relation: The relationship with the vendor is of co-operative type with the kind of purchasing is JIT. So no change is required and hence giving a good support to us

So from the analysis the plant has changed its decisions according to our hypothesis. No deviation has been found in any case. So we are getting a very good support for the *dynamic case number D-8* where it made a transition from S-7 to S-8. This kind of change is very easy to achieve and the plant has done it very successfully.

Case no.11

IDCOL CEMENTS

The IDCOL cements one of the big cement producers set up and run by the Orissa government started its plant in the city of Baragargh, in western Orissa for producing cements for construction purpose. They have got a wide market in the state of Orissa for the cheap cost and better quality Selling the products in the name of Hira cements, one of

the best selling cement in Orissa. The plant has presently (1995) gone for a modernization program and is now using modern technology for producing their product.

INITIAL OBJECTIVES: -

The objectives of the plant 6 years back was

Product variety: -low, volume flexibility: - low, Delivery performance: -low.

The above case falls under *static case S-1* and to meet the objectives the manufacturing decisions taken by the firm was:

Plant and equipment: As being a cement company it has only one product type and hence the plant was a very big plant with the use of only special purpose machines. They were not keeping any buffer stock to meet the delivery date. So the data is supporting our hypothesis.

PPC: There was no such PPC group setup in the organization. No scheduling of the activities was there and was classical kind of inventory management. So the low importance of the group supports the hypothesis.

Labor skills: - The kind of labor in the plant were mostly of semi-skilled type with a very low training given to them. So to meet the low objectives the work force is not needed to be very efficient and hence supporting the hypothesis.

Organization structure: -

Standardization: - The score was found to be 4.8 which was a very high value due to the low product variety and we are getting support from this value for the hypothesis.

Specialization: - The use of specialized people in the plant was moderate at a score of 4.0. Although the low objectives should reduce the number of specialized jobs but the moderate score here is moderately supporting our hypothesis.

Centralization: The score on centralization in the plant was found at a very high value at 5.67. The low dimensions in the objectives should make a very highly centralized decision making and hence the high score fully supports the hypothesis.

Formalization: - The documentation level in the plant was found at a high score of 5.0 and is supporting the hypothesis, as the low product variety will not require any interaction among the departments.

Complexity of the workflow: - The interaction level in the plant was found very low at 3.5, due to the low product variety and is supporting the hypothesis.

Vertical integration: - The score on vertical integration was found very high with as much as 70% of the value added in-house. So the low product variety and delivery performance will necessitate high in-house production hence supporting the hypothesis

Vendor relation: - The firm was having 3 to 4 vendors with a competitive relationship with the vendor. But as stated in the hypothesis due to the high vertical integration they should maintain a co-operative relationship and hence giving a poor support to the hypothesis

So from the above analysis we have found that except for the vendor relation for all the other cases we are getting a good support for the hypothesis. So the data is fully satisfying the *static case S-1*.

******Hypothesis related to the static case S-1 revised as stated:***

- 1 As the plant is a government run organization and is selecting the vendors on quotations basis. Again the firm was having 3-4 vendors. Again the low delivery performance will add-up having a competitive relationship with the vendor

FINAL OBJECTIVES:

The present objectives made by the company is.

Product variety: -low, volume flexibility: - low, Delivery performance: -high.

The above case falls under *static case S-5* of our hypothesis and to meet these objectives the manufacturing decisions taken by the plant was:

Plant and equipment: - The plant and equipment segment has not gone through any change but the plant is now started maintaining huge buffer stock to meet the delivery date. So these finding is supporting the hypothesis

PPC: - The group still not found any importance in the organization. Still they are not scheduling any activity and using classical inventory system. But to meet the delivery date the group needed to have some importance and hence giving poor support for S-5

Labor skills: - The labor type continued to be of semi-skilled with a low training provided to them and this fully supports the hypothesis.

Organization structure: -

Standardization: - The score on standardization presently is 5.8, which means a high use of standard procedures due to the low product variety and is supporting the hypothesis.

Specialization: - The use of specialized job in the plant presently is very high at 5.3. But for these objectives its score should be low and hence is giving a poor support to our hypothesis.

Centralization: - The decision making level is presently at 4.1. This moderate value is due to the need of taking decisions related to setup time and downtime by the lower management and is supporting the static case-S5 of the hypothesis.

Formalization: - The documentation is still very high in the plant at a score of 5.2, which is due to the low product variety. So we are getting support for hypothesis for this case.

Complexity of the workflow: - The interaction level among the departments is now at a score of 3.5. The reason for the low interaction is due to the low product variety and hence the departments have not to interact and we are getting support for the hypothesis.

Vertical integration: - The plant still has 70% of the total value added inside the company and is investing only on the raw material. The low product variety and high delivery performance will necessitate a very high in-house production and hence we are getting a very good support for our hypothesis.

Vendor relation: - Presently the plant is having the same 3-4 vendors per product but have now opted for a co-operative relation with the vendor. This change is due to the fact that the plant is now chasing for a high delivery performance and hence is having a good relation with the vendor. So this proposition is supporting our hypothesis.

From the analysis of the past data we have found a poor support for the case of PPC group, specialization and good support for the other cases. So it is fully validating our hypothesis.

*****The modifications made to the static case S-5 is as given below:**

1. The product variety and the volume fluctuation of the plant are very low. So for a slight increase of delivery performance the plant may not need to increase the importance of the PPC group to a substantial extent and hence the group may remain a less important group in the organization.
2. Because of the high delivery performance the plant may need more specialized kind of job. So the score on specialization may become very high for this case.

RELEVANCE TO THE HYPOTHESIS: -

During the past 7 years the plant has made the following changes in their objectives

Product variety: -low, volume flexibility: - low, Delivery performance: -low.

Product variety: -low, volume flexibility: - low, Delivery performance: -high.

The above change falls under the *dynamic case D-1* of our hypothesis and to achieve these changes manufacturing decisions are changed as given below:

Plant and equipment: - No major change has occurred except the plant has added some more machines during modernization and have increased the capacity of the buffer stock. So this minor change supports the hypothesis.

PPC: - The group remained a very low important group in the organization due to the low product variety. But after the change in the delivery performance the importance of the group has not increased giving moderate support for the hypothesis.

Labor skills: - The kind of labor force hired by the firm is of semi skilled type with a low training provided to them. Due to the low product variety there is no requirement of multi skilled labor and hence the data is supporting our hypothesis.

Organization structure: -

Standardization: - The score changed from 4.8 to 5.8. Although it is remaining high but the increase in the value gives a moderate support for the hypothesis.

Specialization: - The level of use of specialized job increased with score changes from 4.0 to 5.3 and this increase gives a poor support as the product variety is remaining constant.

Formalization: - The score changed from 5.0 to 5.2, which we can consider as constant. Due to the low product variety documentation is needed and it supports the hypothesis.

Complexity of the workflow: - This score is also remaining at 3.5 and this low score is due to low product variety and giving support to the hypothesis.

Vertical integration: - The level of the in-house production for the plant is remaining very high and is at 70% of the total value. The cause is due to the low product variety and high delivery performance. In the later case it is profitable to produce in-house. So we are getting a very good support for our hypothesis.

Vendor relation: - The plant has shifted from a competitive to co-operative relationship with the vendor. But according to the hypothesis it should remain co-operative type and hence we are getting a low support for our hypothesis.

So from the analysis we have found a poor support for the case of specialization, vendor relation and good support for all the other cases. So overall it is giving a very good support for the dynamic case D-1 with certain modification can be made to the case.

****** Hypothesis related to the dynamic case D-1 revised as stated:***

1. Despite of the low product variety the high delivery performance may necessitate use of specialized jobs to meet the order in time. So the score on specialization may become high for this case.
2. As discussed in the static case due to the presence of many vendors in the organization the plant was maintaining a competitive relationship with the vendor as they had a lot of option. But after change in the objectives the high delivery performance needs the plant to keep a co-operative relation with the vendor.

Case no.12

UPTRON INDIA LIMITED

UPTRON is a company set up by the UP government in the year 1975 to produce different electronics components for government use and for commercial purpose. Initially it was a grand success for the plant at the time when there was a boom in the electronics market. But after a huge competition from the private players the company started running in loss. The plant we visited used to produce exchange equipment's, integrated terminals, wireless systems, data entry machines etc but due to loss they are now producing only some of the exchange and wireless systems. The present employee strength of the company is 250.

INITIAL OBJECTIVES: -

Product variety: - high, delivery performance: - high, volume flexibility: -high.

The above case falls under ***static case number 8*** of our hypothesis. To meet these objectives the manufacturing decisions taken by the firm are: -

Plant and equipment: - The plant was a big plant with use of only general-purpose machines to meet the product variety. They were also keeping a huge amount of buffer stock to meet the delivery date. So these data is matching to our hypothesis.

PPC: - This was also a very important activity in the organization. Very heavy scheduling of the activities were done there. Reducing setup time was a very important activity there and hence is giving a very good support to the hypothesis.

Labor skills: - The type of labor recruited by the firm was of moderately skilled type. But a very high amount of training was provided to them, which supports the assumptions in our hypothesis.

Organization structure: -

Standardization: - The score on standardization 7 years back was found at a very high value of 5.11. The reason for the use of standardized procedure in the plant is due to the presence of many plants within a plant for producing different components. So this high score is giving a very good support to the hypothesis.

Specialization: - The use of specialized jobs in the plant was very high with a score of 6.55. This score was found due to the presence of plant within a plant, which necessitate high use of specialized job and hence supporting the hypothesis.

Centralization: - Most of the decision-making authority was in the hand of lower level management as the decisions of change in the setup time and down time to meet the delivery date was taken by the lower management to meet the volume fluctuation and delivery date. So here a score of 3.25 in centralization is supporting our hypothesis.

Formalization: - The use of documented procedure was very high at a score of 5.64. But the high product variety should make the score very low, deviating from the hypothesis.

Complexity of the workflow: - The interaction level in the plant was very high due to the high product variety and the score of 6.25 is supporting our hypothesis.

Vertical integration: - The in-house production in the plant was low with as high as 60% of the value added from outside. The low vertical integration was due to the high product variety and volume fluctuation. So here also we are getting a very good support for the hypothesis.

Vendor relation: - The company was having more than 4 vendors per product with a competitive relationship with the vendor. But all these high objectives necessitate co-operative relationship and hence the data is giving a poor support for the hypothesis.

So from the above analysis we have found a poor support for the case of formalization, vendor relation and a good support for all the other cases and hence supporting the *static case S-8* with minor modifications in it.

******Hypothesis related to the static case S-8 revised as stated:***

- 1 The presence of many plants within a plant and also the fact that it is a government organization will lead to a high amount of documentation of the procedures in the plant. So the score on formalization may be high for this case.
- 2 The plant was having more than 4 vendors and hence has many options for choosing a vendor plus the company is choosing the vendor on quotation basis. So for this kind of situation the plant may go for a competitive relationship with the vendor.

FINAL OBJECTIVES: -

The present manufacturing objectives of the plant is as follows:

Product variety: - low, volume flexibility: - low, delivery performance: -high.

Plant and equipment: - The plant is still continuing with the general-purpose machines with some addition of some special purpose machines. They still keeping a lot of buffer stock which gives moderate support to the hypothesis.

PPC: This group has lost some of its importance as no scheduling is there and is using build up or rundown inventory system. But now the material management is of MRP kind of system and this moderate importance of the group is supporting our hypothesis.

Labor skills: - The labor force continued to be of moderately skilled type with a moderate training given to them. The low variety in product requires this kind of labor and hence the data is fully supporting our hypothesis.

Organization structure: -

Standardization: - The present score of standardization is high at 4.0. The low product variety will necessitate high use of standardized procedures and this score is moderately supporting the hypothesis.

Specialization: - The low product variety should make the use of specialized jobs very low and the score of 4.33 gives a good support to the hypothesis.

Centralization: - The score on centralization is presently 3.65, which is a moderate value. As the lower level management may take some decisions related to the delivery performance this moderate score is supporting our hypothesis

Formalization: -The present score of formalization is 3.42, which is a very low value. But the low product variety may require the documentation of all the procedures and the score should be high. So this score is giving a poor support for the hypothesis

Complexity of the workflow: - The level of interaction among the departments is presently very low at a score of 3.5, which supports the hypothesis

Vertical integration: - The plant has started producing the product in-house with a value addition of 70% in-house. This increase in the level is due to the low product variety and high delivery performance. So this is fully supporting our hypothesis.

Vendor relation: - The plant is still having more than 4 vendors with a competitive relationship with them. But this gives a poor support to the hypothesis.

So from the analysis of the present data we have found that we are getting a poor support for formalization and vendor relation and good support for the other decisions. So overall it is supporting the hypothesis for *case S-5* after creation changes in hypothesis

***** The Hypothesis for the case S-5 revised as stated:**

1. No reason can be given for the low documentation and hence is an unexplained case.
2. The company is presently more than 4 vendors. So despite being required to meet the delivery date due to government procedures they are forced to have competitive relationship with the vendor.

RELEVANCE WITH THE HYPOTHESIS: -

Following changes in objectives has been made during the past 7 years

Product variety: - high, delivery performance: - high, volume flexibility: -high →

Product variety: - low, volume flexibility: - low, delivery performance: -high.

The above case falls in the *dynamic case D-26* of our hypothesis. To meet with all these objectives the change in the manufacturing decisions are as

Plant and equipment: - Not much change occurs except the plant procures some special purpose machines to meet the low product variety. So here we are getting a moderate support for our hypothesis.

PPC: This group has gone through certain change with the change in product variety and now scheduling is not an important activity for them. But still they are using MRP system. So the shift from high to a moderately important group supports our hypothesis.

Labor skills: - The labor type remained of moderately skilled with the training provided to them is very low and this change gives a low support to our hypothesis.

Organization structure: -

Standardization: The score changed from 5.11 to 4.0. The high value initially was due to the presence of plants within plant. So the score is remaining still high supporting the hypothesis.

Specialization: - With the decrease of product variety from high to low the score decreased from 6.55 to 4.33 supporting our hypothesis.

Centralization: - This score has also made certain increase due to the decrease of volume fluctuation from high to low as now some more decisions are taken at the higher level. So the increase from 3.25 to 3.65 is supporting our hypothesis.

Formalization: - The documentation in the organization is not done according to the hypothesis and is acting in a reverse way deviating from our hypothesis.

Complexity of the workflow: - With the decrease in the product variety the interaction among the functional departments has decreased and the score changed from 6.25 to 3.5 which gives a very good support to our hypothesis.

Vertical integration: - The in-house production increased from 40% to 70% due to the change of product variety and this increase is giving support to the hypothesis.

Vendor relation: - The company has more than 4 vendors with a competitive relationship with them. But it should be co-operative type and hence giving poor support for the case.

So from the analysis we are having a poor support for labor skill, formalization and vendor relation and moderate to high support to the other changes in the manufacturing decisions for *dynamic case D-26*. This is a difficult type of change to achieve and the plant has done it to some extent with some changes may be made.

****Hypothesis related to dynamic case D-26 revised as below:*

- 1 As stated the plant being government plants and abides by the government rules they were not able to change the labor type despite of the change in the objectives So the type of labor may remain moderately skilled for this case
- 2 The documentation may be very high initially due to the presence of plant within plant and may decrease later on as there was no multi plant and to meet the delivery date some use of non-documented procedure required. So the score may change from high to low for this case.
3. Despite of the objectives the plant due to the presence of more than 4 vendors per product the plant may keep a competitive relation with the vendor for these cases

Case no.13

KANPUR PLASTIPACK LIMITED

Kanpur Plastipack limited is a government-supported company has its plant in the city of Kanpur. The plant has been set up in the year of 1972 and is now busy in producing circular woven fabrics of different specifications. It is a small company with total employee strength of 326 The company is manufacturing bags of different types supplying to the consumers like Duncans, indo-golf, Chambal fertilizers etc. plus they are exporting the bags to different companies.

INITIAL OBJECTIVES:-

The initial objectives of the company 7 years back was:

Product variety:- high, volume flexibility:- high, delivery performance:- low.

The above case falls in the *static case S-4* of our hypothesis. To meet the above objectives the different manufacturing decisions taken by the firm are:

Plant and equipment:- The kind of machinery used by the firm are mostly of general-purpose type. They were using flow-lines to meet the fluctuation in the volume level So this data is giving full support to the hypothesis.

PPC:- This group was having a very high importance in the organization Scheduling is a very important activity in the organization Also they were using MRP kind of material management system. So this high importance of the group is giving a very good support.

Labor skills:- The kind of labor include all types from low skilled to multi-skilled. But to handle the general purpose machines most of them were multi-skilled type with a moderate training provided which is fully supporting our hypothesis.

Organization structure: -

Standardization:- This score was found at a moderate value at 4.00. But the high product variety should restrict the organization to use standardized procedures. So this score is giving a moderate support to our hypothesis.

Specialization:- The use of specialized jobs in the organization was very high at a score of 5.22 This is due to the high product variety and it led to the high distribution of official duties among workers So we are getting a good support for the static case 4

Centralization:- The decision-making authority in the organization was very low at a score of 3.65 This was to meet the high volume fluctuation some decisions were taken at the lower level supporting our hypothesis.

Formalization:- The use of documented procedure in the organization was very high at a score of 4.14 But for these objectives it should be low and hence we are getting a very moderate support for this case.

Complexity of the workflow. - There was a lot of interaction present in the organization to meet the high product variety. The score was at 5.25, which is a very high value, supporting our hypothesis

Vertical integration:- The high product variety and volume flexibility will lead to a low vertical integration But here we are getting a very high score as 80% of the value is added inside the company. So we are getting a very low support for the hypothesis

Vendor relation:- The relationship with the vendor should be of competitive type for this objectives. But here we are getting a co-operative relationship with the vendor giving a very low support for our hypothesis

From the above analysis of the data for the case 7 years back we are getting a poor support for the case of vertical integration and vendor relationship and good support for all the other cases

*** *Hypothesis related to the static case 4 has been revised as stated:*

- 1 Despite of the high product variety the plant is manufacturing most of the parts in-house as the plant manufacturer plastic bags and there is no presence of assembling of any part So the vertical integration may be high for this kind of organization.
- 2 No reasonable cause can be given for this kind of vendor relationship with the vendor.

FINAL OBJECTIVES:-

The present manufacturing objectives of the company is as follows

Product variety:- high, delivery performance:- high, volume flexibility:- high.

This falls on the ***static case number 8*** of our hypothesis To meet all these manufacturing objectives the manufacturing decisions taken by the firm is

Plant and equipment:- This sector had gone through certain change. Although the plant is still using general-purpose machines but have started keeping huge buffer stocks to meet the delivery date. So here we are getting full support to the hypothesis

PPC:- This is still a very important group in the organization with heavy scheduling of the activities done for planning Also they are using MRP kind of inventory management increasing the importance of the group which supports our hypothesis.

Labor skills:- The kind of labor recruited by the firm are still highly skilled with a moderate training provided which supports our hypothesis

Organization structure:-

Standardization:- The present use of standardized procedure in the organization is still very low as they have to meet with the high product variety. The score is now 3.66, which is a low value supporting our hypothesis

Specialization:- The score of specialization is presently 5.55, which is a high value due to the distribution of duties among the workers, hence supporting our hypothesis.

Centralization:- The present level of decision making among the employees is low at 3.65, which is a low value of centralization as to meet the objectives most of the decisions are taken at the lower level supporting static case number 8.

Formalization:- - The score of formalization is found to be 4.14, which means a high documentation of all the procedures But the high objectives should lead the plant to use non-documented procedures and hence it is giving a moderate support to the hypothesis.

Complexity of the workflow.- The interaction level in the organization was found at a very high level with a score of 5.25. The high product variety will lead a high level of interaction and we are getting a very good support for our hypothesis.

Vertical integration:- The level of in-house production is still very high with as high as 80% of the total goods are produced in-house. But the high objectives should make the plant bring a lot from outside and hence we are getting a poor support in this case.

Vendor relation - The plant is going for a co-operative relationship with the vendor with an average of more than 4 vendor per product. So it is properly matching with the hypothesis.

So from the analysis we have found a poor relationship for the formalization, vertical integration and a good support for all the other decisions.

*** Hypothesis related to the static case 8 revised as stated:

- 1 As stated the plant is manufacturing only plastic bags and hence doesn't require any brought out assembly for production except the raw material. So the vertical integration may be found very high for this case

RELEVENCE WITH THE HYPOTHESIS: -

The plant had gone through the following changes in the past 7 years:

Product variety:- high, volume flexibility:- high, delivery performance:- low →

Product variety:- high, delivery performance:- high, volume flexibility:- high.

The above kind of change falls in the *dynamic case D-24*. To meet the above changes the change in the manufacturing decisions taken by the firm were:

Plant and equipment:- This had gone through a little change with the plant started using buffer stock to meet the delivery performance. No other change has occurred and hence we are getting a good support to our hypothesis.

PPC:- The production planning group always remained a very important group for the plant and scheduling is a very important activity for them. No change had occurred for the change in the objectives and that gives a very good support to the hypothesis.

Labor skills:- The plant was having multi-skilled labor for handling the general-purpose machines and it gives a good support to the hypothesis.

Organization structure:-

Standardization:- The structure of the organization has not gone through any minute change from 4.0 to 3.66 and is remaining at a low level giving a very good support to hypothesis

Specialization:- This score has also remained at a high level with an increase from 5.22 to 5.55, which gives a very good support to the hypothesis

Centralization:- To make the decisions for the change in the flow-lines for meeting the change in volume and also to change setup time etc. for meeting delivery date most of the decisions are taken at the lower level with a score of centralization at 3.65. So we are getting a good support in this case also

Formalization:- The documentation of the procedures was very high in the organization with the score changing from 4.14 to 4.4. But it should remain low and hence we are getting a very low support for the hypothesis for this case.

Complexity of the workflow:- No change has occurred in this section with a high interaction among the departments to meet the product variety and the score on the complexity of workflow is remaining at 5.25, giving a good support to our hypothesis

Vertical integration:- To meet the above objectives the plant should depend on the vendors a lot and the level of vertical integration should be low. But for this plant we are finding a high vertical integration with the in-house production at 80%. So this finding is giving a very low support to the hypothesis.

Vendor relation:- The plant was going for a co-operative relationship with the vendor. But for this change it should change from competitive to co-operative and hence is giving low support for the hypothesis

From the above analysis of the dynamic case we have found a low support for formalization, vertical integration, vendor relation and a good support for the other cases. So overall we are getting a good support for the *dynamic case D-24* after making certain changes.

***** Hypothesis related to the dynamic case D-24 revised as stated:-**

1. As stated for the static case the organization being a government sector, documentation for all the work is required there. So the score for formalization may be very high for this case.

2. The plant is producing only plastic bags and value addition from outside is for the raw material only. So despite of the high objectives the vertical integration may remain low for this kind of plant
3. The vendor relationship is more dependent on vertical integration rather than the manufacturing objectives. So for a high vertical integration the relationship may be of competitive type

Case no.14

TRACKPARTS INDIA LIMITED

Trackparts India Limited is a medium scale company situated in the city of Kanpur. It has got two plants, one in Panki and the other one in Udyognagar. We have visited the Udyognagar plant. The plant is mainly meant for the manufacturing of undercarriage tracks for the crawler, tractors and bulldozers. Also some closed die forging and steel forging are done in that plant. During the past seven years the plant has not gone through any substantial change in their manufacturing objectives and is found to have relevance with our static case S-7 of the hypothesis.

MANUFACTURING OBJECTIVES:-

The manufacturing objectives of the company are as follows.

Product variety:- high, delivery performance:-high, volume flexibility:- low.

The above objectives fall on the static case S-7 of our hypothesis. To match the above manufacturing objectives the manufacturing decisions taken by the firm are given below.

Plant and equipment:- The plant was having a lot of general purpose machines with a very few presence of the special purpose machines and the ratio of the general to the special purpose machines in numbers is 17:3. Also they are keeping some buffer stock to meet the delivery date which supports our hypothesis.

PPC:- This is not a very important group in the organization. No scheduling of the activities are done and were using classical kind of inventory management system. But

the high product variety and the delivery performance should make this a very important group and the data is giving a low support for our hypothesis

Labor skills:- The type of the labor hires by the firm are of semi and low skilled with a moderate training provided to them. But according to the objectives the plant should have multi-skilled labor force to handle the special purpose machines and we are getting a low support for this case also

Organization structure:-

Standardization:- The use of standardized procedure in the plant is very low with the score on standardization being 3.8. The low use of standardized procedure was due to the high product variety and we are getting a good support for our hypothesis

Specialization:- The plant is using moderately specialized people with the score on specialization is 4.2. But the high product variety should create a lot of specialized jobs and hence this value is moderately supporting our hypothesis

Centralization:- This score was found at a high value at 5.2. But the high product variety and delivery performance necessitates most of the decisions taken at the lower level and the high score is giving a poor support to the hypothesis

Formalization:- There is very low documentation of the procedures in the plant with the score being changing from 3.4 initially to 3.65 presently. This change can be ignored and the low value of formalization supports the hypothesis

Complexity of the workflow:- The interaction level as found was very high due to the high product variety and delivery performance and the score had gone through a minute change from 5.5 to 6.0. So this high value in both the cases supporting our hypothesis

Vertical integration:- The in-house production of the plant was moderately low with 45% of the value added inside the company. The product variety would necessitate high dependence on the outside parts and on the same way high delivery performance will require timely delivery from the plant. So the moderate value is supporting our hypothesis.

Vendor relations:- The plant was having 3 vendors per product and are maintaining a co-operative relationship with the vendor. So the data is fully supporting our hypothesis.

From the above analysis of the past and the present data we have found that all the manufacturing decisions of the plant are remaining constant except a minute

change for the case of formalization and the complexity of the workflow. So this is a static case with no change in the objectives for the plant and for this we are getting support to our hypothesis except for PPC, labor skill and centralization. So overall we are getting a good support to the static case S-7 and some modifications can be made to it

*** *Hypothesis related to the static case S-7 revised as stated:*

- 1 The plant is a very small plant and it was not possible for them to have a separate PPC group. Also heavy scheduling of the activities was not possible there. So the group may have a very low importance for this case.
- 2 As stated earlier the plant being a small plant and due to scarcity of the fund it may not be possible for them to hire highly skilled labor. So the labor force may be of low skilled for this case.
- 3 Despite of the higher objectives the owner of the plant has a high desire for power and position and hence most of the decisions are taken at the higher level. So the centralization may remain high for this case.

Case no.15

TANNERY AND FOOTWEAR CO. OF INDIA

TANNERY AND FOOTWEAR INDIA is a tanning company setup by the British govt around 126 years back in the city of Kanpur for tanning of leather and for production of footwear for the military and the paramilitary forces. Initially a private company the government took it in 1968 and used it primarily for the production of the defense items. But due to the external competition the company made a huge loss and became a sick industry.

INITIAL OBJECTIVES: -

The manufacturing strategy of the firm some year's back was:

Product variety: - high, delivery performance: - high, volume flexibility: - high.

The above objectives falls in the *static case S-8* and to meet the manufacturing objectives of the firm the manufacturing decisions taken by the firm were as follows:

Plant and equipment: The high level of all the three objectives made the firm to use only the general purpose machines with the ratio being of general to the special purpose machines being 98 2 in numbers. The buffer stock that was kept by the company was also very high to meet the delivery date and also they were using flow-lines to meet the change in the volume. So this is perfectly matching with our hypothesis.

PPC: The group was having a lot of importance in the organization with 23 people were there in the organization for handling all these activities. Scheduling of the activities were done to meet the medium term planning. But classical kind of material management system was used giving a moderate support to our hypothesis.

Labor skills: The kind of the labor force used by the plant was of mainly semi-skilled type with a moderate amount of training provided to those people. So here we are getting a very moderate support to our hypothesis.

Organization structure:

Standardization: The level of the use of standard procedures in the organization was very low at a score of 3.44. The high range of all the three objectives proves the fact that always there was a variation in the product and hence they were following mostly non-standard procedures so we are getting a good support for this case.

Specialization: This level was also found at a very low level of 3.33. But the high objectives should make the score very high. So we are getting a very low support for our static case.

Centralization: The level of decision making in the organization was found at a moderate value at 4.03. As most of the decisions on the change in the flow-lines and for any change in the setup time should be taken by the lower level management the moderate value gives a moderate support here for the hypothesis.

Formalization: The level of the documentation in the organization was at a high score at 4.35 to meet the change in the product they were relying on the non-documented procedures. So the data is giving a good support here also for the hypothesis.

Complexity of the workflow: The interaction level of the various departments found to be at 3.5, which is a low value. But to meet the high dimensions of all the objectives the value should be high. So it is also giving a poor support to our hypothesis.

Vertical integration: The level of vertical integration was found at a low level of 30% only as most of the product and raw material brought from outside to meet the product variety and volume fluctuation. So it is also giving a good support to us

Vendor relation: The number of the vendor for the organization was more than 4 with a kind of competitive relationship with the vendor But for this case it should be of co-operative relationship and hence we are getting a low support for this case

So from the analysis of the data we have found a good relevance to the **static case no.8** of our hypothesis except for the case of specialization and vendor relationship of the manufacturing decisions

****** So the hypothesis under static case S-8 revised as stated:***

- 1 As seen from the data all the objectives of the firm is high. So the high delivery performance needs a co-operative and high volume fluctuation for a competitive relationship with the vendor. So here the later dimension predominates. So the relationship with the vendor may be of co-operative type.
2. There is no explained cause for the specialization and the complexity of the workflow

FINAL OBJECTIVES:

The present manufacturing objectives of the firm is:

Product verity:- low, delivery performance:- low, volume flexibility:- low.

Due to the decrease in the demand because of the stoppage of the government supply and external competition the firm was not able to compete and had made the objectives at the lowest level. For reaching this new target the decisions taken by the firm was

Plant and equipment: The changes occurred in this sector was not drastic with the ratio of general to special still is 98: 2 But the plant has now stopped to keep the buffer stock due to the low demand and no hurry to meet the delivery date So we are getting a low support for this case.

PPC: The PPC group has changed their medium term planning system to the kind of build up or run down inventory type The material management system stills remaining classical types Now the group is not having much importance in the organization giving a good support to our hypothesis.

Labor skills: - The kind of the labor force required by the organization is presently of semi-skilled type with a moderate training given to them. So due to the low objectives the plant doesn't require multi-skilled labor so we are getting a very good support to the hypothesis.

Organization structure: -

Standardization: - This score is found presently at 4.78, which is a very high value. This is found due to the product variety at the lowest position and hence the plant is using only standardized procedures. So this supports to our hypothesis.

Specialization: - This score is found at a low value of 3.55. As the product variety is low so there was no need in the organization for the distribution of the official duties among the workers. So this gives a very good support to the static case.

Centralization: - The decision-making authority among the workers was found at a moderate score of 4.03. As the objectives like the delivery performance and the volume flexibility is low so all the decisions are taken at the higher level making the value high. So in this case we are getting a moderate support for this case.

Formalization: - The score of formalization was found at a high value of 5.0. As the product variety is low the scope of documentation of all the procedures is very high and hence we are getting a very high formalization value giving support to the hypothesis.

Complexity of the workflow: - The complexity of the workflow score was found to be 3.5, which is a very low value. The reason is due to the low interaction among the departments due to the low product variety. So it is also giving a very good support to us.

Vertical integration: - The in-house production of the plant is very low and 20% of the value is added inside the company. But due to the low product variety and low volume flexibility the vertical integration should be very high. So we are getting a very low support for this case.

Vendor relation: - The number of the vendor for a particular product is found to be 1 with no special attention given to the vendor. So this gives a very low support to the static case which states that the relation should be of co-operative type.

From the analysis of the present data we have found a weak support for the case of plant and equipment and vertical integration and good support for all the other cases.

*** *So the hypothesis under static case S-1 revised as stated: -*

- 1 The plant had changed the objectives due to the change in the market and scarcity of the fund. So despite of the change in objectives they were not able to make substantial change in this sector.
- 2 Despite of the low product variety and volume flexibility the firm was not able to produce everything in-house due to the scarcity of the fund. So the vertical integration may be low for this case.

RELEVANCE WITH THE HYPOTHESIS: -

The plant has gone through the following changes in the objectives.

Product variety: - high, delivery performance: - high, volume flexibility: - high →

Product variety: - low, delivery performance: - low, volume flexibility: - low.

The above case falls under dynamic case D-17 of the hypothesis and to meet the above changes the change in manufacturing decisions taken by the firm is

Plant and equipment: - There is not any change occurred in this section as the ratio between general to special purpose machines still remaining 98:2. But the plant has stopped keeping buffer stocks. So here we are getting a moderate support to the hypothesis.

PPC: - With the change in the objectives from high to low value this group has gone through a lot of change. Now it has very low importance in the plant. Now no scheduling of the activities is done for medium term planning. So we are getting a good support for the hypothesis for this change.

Labor skills: - No change was there in the type of labor in the organization giving a low support for the hypothesis.

Organization structure:

Standardization: - This score has changed from 3.44 to 4.78. With the decrease of the objectives it should increase which we are getting here supporting the hypothesis.

Specialization: - The use of specialized job in the plant is remaining nearly constant. But the value should decrease from high to low. So we are getting a low support for this case also to the hypothesis.

Centralization: - The decisions making authority is remaining at moderate score of 4.03 and not changing with the change in objectives. So we are getting a moderate support for this case to the hypothesis.

Formalization: - The documentation in of the procedures in the organization has increased from 4.3 to 5.0 with the decrease of the objectives giving a good support for the hypothesis.

Complexity of the workflow: - The interaction level is very low at 3.5 due to the low dimensions of the objectives and hence is supporting the hypothesis.

Vertical integration: - The in-house production in the plant is remaining low and changed from 30% to 20%. But it should be high for the low product variety and volume fluctuation. So we are getting a poor support for this case to the hypothesis.

Vendor relationship: The relationship with the vendor has changed from competitive to co-operative type. But it should remain that of co-operative type and is giving a low support for the hypothesis.

So from the analysis of the dynamic case D-17 we are getting a low support for the case of labor skills, specialization and vendor relation and good support for all the other cases. This is a difficult type of change to occur and the plant had done it to some extent.

***** Hypothesis related to case D-17 revised as stated:**

1. The organization being a government organization they have special policy for hiring labor force. So with the change in the objectives they may not be able to change the labor and it may remain of semi-skilled type.
2. No specific reason can be given for the low score on specialization. So it is a unexplained case.
3. As stated for the static case the volume flexibility may be a dominating factor in the plant and hence they may have a competitive relation with the vendor.

Case no.16

THE INDIA THERMIT CORPN. LTD.

The India Thermit Corporation limited is a private sector undertaking established in the city of Kanpur in the year 1951. It is a large-scale company with the

total employee strength of 600 plus It has two units, one in Faizal gang and the other one in Panki The Faizal gang plant visited by us is manufacturing aluminothermic portions for rails

INITIAL OBJECTIVES: -

The initial objectives of the company 7 years back was.

Product variety: - high, delivery performance: - low, volume flexibility: -low

The above falls in the ***static case S-3*** of our hypothesis and to meet the objectives the manufacturing decisions taken by the firm were.

Plant and equipment: -According to the data provided to us the plant is using only general-purpose machines to meet the high product variety But the amount of buffer stock kept by it is low due to the low performance in the delivery. So these prepositions properly matching with our hypothesis

PPC: The group was not playing so important role in the organization. They were using increase or decrease in the shift for the medium planning with some scheduling was there. Also they were using classical inventory system. Despite of the high product variety the low score on the other objectives will make it a moderately important group, which supports our hypothesis

Labor skills: The type of labor hired by the firm was very highly skilled to handle the general-purpose machines So it supports our hypothesis

Organization structure:

Standardization: The score on standardization was very low at 3.33. So the high product variety will necessitate the use of non-standard procedures and hence this low value is supporting our framework.

Specialization: Due to the high product variety there was a number positions and distribution of work So there was high presence of specialized job with a high score of 5.11, which fully supports the hypothesis.

Centralization: - The score on centralization was found at a moderate value at 4.0. But to meet the high product variation it should be low and is giving a moderate support for the hypothesis.

Formalization: - The level of documentation in the plant was high at 4.5. But the high product variety should make the documentation very low and hence is giving a poor support to the hypothesis.

Complexity of the workflow: - The interaction between various departments was very high with a score of 4.5, which is supporting our hypothesis.

Vertical integration: - The value addition within the company was at a moderate level with the vertical integration of 50% was there. This was due to the high product variety and hence all in-house production is not possible. So this moderate score is supporting our hypothesis.

Vendor relation: - As the delivery performance and the volume fluctuation both were low so the company was having 2 vendors per product and were having no intended policy for the vendor. So we are getting support for the hypothesis.

From the above analysis of the data we have found a poor support for formalization and good support for all the other cases and hence is satisfying our static case S-3 with certain revision can be made to it.

***** Hypothesis related to the static case S-3 revised as stated:**

1. Despite of the high product variety the fact that company is an ISO certified company forced it to heavy documentation. So the score on formalization may be high.

FINAL OBJECTIVES: -

The present objectives of the firm are as follows:

Product variety: - *high*, **delivery performance:** - *high*, **volume flexibility:** - *high*.

The above falls under *static case S-8* and to meet the above strategy the decisions taken by the firm were as follows.

Plant and equipment: - The company made certain change in this segment. Presently they are keeping huge buffer stock to meet the delivery performance. So the data is fully supporting our hypothesis.

PPC: - Presently scheduling is a very important activity in the plant. But they still are using classical type of inventory management system. So the findings are giving a moderate support for the PPC group.

Labor skills: - The plant is using very highly and multi skilled labor force for achieving the high dimensions of the objectives. So this fully supports the hypothesis

Organization structure: -

Standardization: - The present score on standardization is very high at 5.11. But for the high objectives the plant should use non-standard procedures. So this high score is giving a poor support for the hypothesis.

Specialization: - The score on specialization in the firm is very high at 6.22, which was due to the high dimensions in the objectives and the plant is using specialized job for that. So the score is supporting our hypothesis.

Centralization: - The decision-making authority in the plant is partially in the hand of lower level management with a moderate score of centralization at 4.0. But the objective necessitates decentralized decision-making and is moderately supporting the hypothesis.

Formalization: - The level of documentation in the plant is presently very high at 5.64. But the high product variety should make a low documentation of the procedures. So we are getting a very low support for the static case.

Complexity of the workflow: - The interaction level in the plant is very high to meet the high product variety and a high score of 5.0 fully supports the case S-8.

Vertical integration: - The score on vertical integration is moderate level at 50%. The moderate score is due to the fact that the high product variety necessitates low in-house production and the high delivery performance enhances the in-house production. So the level of vertical integration supports our hypothesis.

Vendor relation: - The plant is presently having 3 vendors per product with a competitive relation with the vendor. But for these objectives the relationship should be cooperative and hence we are getting a low support for the hypothesis.

So from the above analysis we are getting a low support for standardization, formalization, vendor relation and a good support for all the other cases. So this data is satisfying our hypothesis with some revisions made to it.

****** Hypothesis related to static case S-8 revised as stated***

1. No proper reason has been found for the high score on standardization and specialization. So this is an unexplained case.

- 2 The plant was having 3 vendors per product and also maintaining a high volume fluctuation. So for this it may maintain a competitive relation with the vendor.

RELEVANCE WITH THE HYPOTHESIS:

The plant has gone through the following change in their objectives

Product variety: - high, delivery performance: - low, volume flexibility: -low→

Product variety: - high, delivery performance: - high, volume flexibility: -high.

The above change falls under *dynamic case D-6* of the hypothesis. To meet the changes the change in decisions made by the plant were

Plant and equipment: - The plant has not gone any changes expect they are now using huge buffer stock to meet the delivery date So no major change occurs in this segment and is fully supporting our hypothesis.

PPC: - This segment gained certain importance after the delivery performance and volume fluctuation both became high. They are now scheduling the operations but still using classical inventory management So it partially supports the hypothesis.

Labor skills: - The labor force recruited by the firm is multi-skilled type to handle the special purpose machines. So it fully supports the hypothesis

Organization structure: -

Standardization: - The score changed from 3.33 to 5.11. But the score should remain constant and at a low value and hence we are getting a low support for D-6.

Specialization: - The score remained very high with a change from 5.11 to 6.22 to meet the delivery performance. This high use of specialized job in the plant fully supports our hypothesis

Centralization: - The decision-making authority of the plant is remaining at a moderate score at 4.0, moderately supporting the hypothesis.

Formalization: - The documentation in the plant is very high with the value changing from 4.5 to 5.64 So this high score gives a low support for the hypothesis

Complexity of the workflow: - there was very high interaction among the departments to meet the high product variety The score made a minor change from 4.5 to 5.0 and the high score supports the hypothesis

Vertical integration: - The level of vertical integration is remaining moderate at 50% According to the hypothesis no change is needed and hence supports our case D-6

Vendor relation: - The plant has changed the relation with vendor from neutral to competitive type, which poorly supports the hypothesis

So from the analysis we have found low support for standardization, formalization, vendor relation and good support for the other cases So the data supports the hypothesis for case D-6 with certain revision can be made to it

***** *Hypothesis related to the case D-6 revised as stated:***

- 1 For the high use of standard procedure in the plant no cause has been give So this is an unexplained case for the hypothesis.
2. Due to the fact that the company is ISO certified company the documentation was very high there. So the score on formalization may be high for that
- 3 Due to the presence of 3 vendors per product the company has option for choosing a vendor. So they may go for a competitive relationship with the vendor.

CHAPTER-6

RESULTS AND DISCUSSIONS

From the collected data analysis has been done for all the 16 cases. In the framework proposed by Reddy (1999) there are 8 static cases and 28 dynamic cases. From the data the result found for the match with the static and the dynamic cases is given in the table in the next page. From the analysis we have found in a total of 100 occasions where our data is deviating from the original hypothesis. For those 100 cases in 85 cases we have made correction and revised the hypothesis. For the rest 15 cases no reasonable cause has been found and was left as unexplained cases.

From the analysis it was found that out of the 16 cases that we have analyzed 2 companies are not making any changes in their strategy and are remaining static. For the rest 14 companies which have made certain changes in their objectives i.e. made dynamic changes, six companies have made the change that is easy to achieve, one has made the change that is moderately difficult to achieve and rest seven companies gone through the type of change which is very difficult to reach. For those companies where they have gone for the easy or moderately difficult kind of change they have easily achieved it, as they have to make changes only in the soft decisions. But the companies where it has gone for a very difficult kind of change they had to make changes in the soft as well as hard decisions. So some companies like LSL, Maruti Udyog, Hero-Honda, Kanpr Plastipack have achieved the changes very successfully because of the sufficient fund available with them. But for the companies like Kanpur woolen, UPTRON and Tannery and Footwear have made heavy losses for changing their objectives and were not able to survive in the market. The cause for the negative results due to the fact that all these are government companies and were driven by the government rules and regulations. Also for achieving this change in the objectives there was not sufficient fund provided by the government and hence these companies were not able to survive in the competitive market.

NO	COMPANY'S NAME	INITIAL OBJECTIVE	FINAL OBJECTIVE	DYNAMIC CHANGE
1	LOHIA STARLINGER LTD.	S-6	S-8	D-28
2	EMA INDIA LTD	S-1	S-6	D-10
3	DUNCANS INDIA LIMITED	S-5	S-5	—
4	MARUTI UDYOG LIMITED	S-1	S-8	D-17
5	HERO-HONDA MOTERS	S-2	S-7	D-20
6	FRONTIER SPRINGS	S-7	S-8	D-8
7	CAWONPOOR WOOLEN LTD	S-8	S-5	D-26
8	INDAL, HIRAKUD (ORISSA)	S-5	S-6	D-7
9	PEPSI-CO	S-2	S-6	D-3
10	EVERADEY IND LIMITED	S-7	S-8	D-8
11	IDCOL CEMENTS, BARAGARGH	S-1	S-5	D-1
12	UPTRON INDIA LTD.	S-8	S-5	D-26
13	KANPUR PLASTIPACK LTD.	S-4	S-8	D-24
14	TRACKPARTS INDIA LTD	S-7	S-7	—
15	TENNARY AND FOOTWARE LTD.	S-8	S-1	D-17
16	THE INDIA THERMIT LTD.	S-3	S-8	D-6

The framework has been developed on the basis of the eight static cases. So the number of times for which we are getting match for the static cases are given as stated

Static case.	Number of matches
S-1	4
S-2	2
S-3	1
S-4	1
S-5	6
S-6	4
S-7	5
S-8	9

CONCLUSION AND SCOPE FOR FURTHER RESEARCH

Total 16 companies have been studied and the original hypothesis has been revised. From the analysis we have found there is scope to revise the hypothesis for 100 cases. We have revised the hypothesis in 85 cases. For the rest 15 cases no proper reason has been found for the deviation of the data from the original hypothesis. So the rest 15 cases have been found unexplained case for deviation from the original hypothesis.

7.2 SCOPE FOR FURTHER RESEARCH:

There are numerous scopes for the further research on this topic

1. In our hypothesis we have developed on the basis of equal weightage to all the three manufacturing objectives i.e. product variety, delivery performance and volume flexibility. But many companies used to give more priority to one objective as compared to other. So a relative scale can be given to make a relative measure of these objectives and according to that scale how companies are making their decisions to meet the objectives can be studied.
2. In the present hypothesis objectives are related to the decisions and for a particular set of objectives the company makes the decisions. But we have not made any interrelations among various decisions and how one decision affects the other has not been studied. For example if we relate three decisions namely standardization, formalization and centralization then if a company became liberal for documentation and for the use of standard procedures then to neutralize this they will make the decision making centralized and vice versa. So in this way one set of decisions can be interrelated and this aspect can be studied.

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APPENDIX-A

QUESTIONNAIRE

1. Name of your company:
2. Primary product of the company:
3. Please specify your name and designation:

*Five to Seven years back what was your:

1. product verity: High ☐ Low ☐
2. volume flexibility: High ☐ Low ☐
3. Delivery performance: High ☐ Low ☐

*Presently what is your:

1. product verity: High ☐ Low ☐
2. volume flexibility: High ☐ Low ☐
3. Delivery performance: High ☐ Low ☐

* What is the proportion of general to special purpose machines in your organization: ____:____ .

INSTRUCTIONS:

On a scale of 1-7:-

- (1) Low (Not an issue for your manufacturing)
- (2) Somewhat higher (Lower than most others in your industry)
- (4) Moderate (Comparable to most others in the industry)
- (6) High (comparable to best in the industry)
- (7) Very High (Leader in the market)

5 TO SEVEN YEARS BACK :

- (1) Your requirements(as dictated by market) to compete with price- ☐
- (2) Your requirements(as dictated by market) to respond to swing in volume- ☐
- (3) Your requirements(as dictated by market) to introduce new product quickly- ☐
- (4) Your requirements(as dictated by market) to deliver on time- ☐

PRESENTLY :

- (1) Your requirements(as dictated by market) to compete on price- ☐
- (2) Your requirements(as dictated by market) to respond to swing in volume- ☐
- (3) Your requirements(as dictated by market) to introduce new product quickly- ☐
- (4) Your requirements(as dictated by market) to deliver on time- ☐

CURRENT AND PAST STATUS OF MANUFACTURING DECISIONS:

**THE LEFT BOX IS FOR CURRENT AND RIGHT FOR STATUS 5 TO 7 YEARS BACK*

PRODUCTION PLANNING AND CONTROL:

1. To match productive capacity to variable demand over medium term planning

horizon(12-18 months) you rely on-

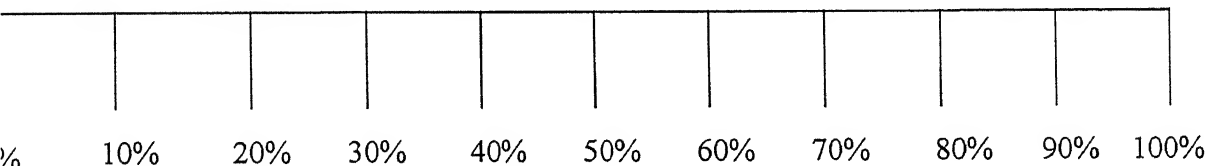
- | | | |
|---|--------------------------|--------------------------|
| (a). Scheduling. | <input type="checkbox"/> | <input type="checkbox"/> |
| (b) Build up or run down finished goods inventory. | <input type="checkbox"/> | <input type="checkbox"/> |
| (c) Increase or decrease working shifts/workers/time/any other. | <input type="checkbox"/> | <input type="checkbox"/> |

2. Does your firm pursue any particular scheme for inventory management

- | | | |
|---|--------------------------|--------------------------|
| (a) MRP. | <input type="checkbox"/> | <input type="checkbox"/> |
| (b) JIT | <input type="checkbox"/> | <input type="checkbox"/> |
| (c) Classical. production and inventory system. | <input type="checkbox"/> | <input type="checkbox"/> |
| (d) Any other. | <input type="checkbox"/> | <input type="checkbox"/> |

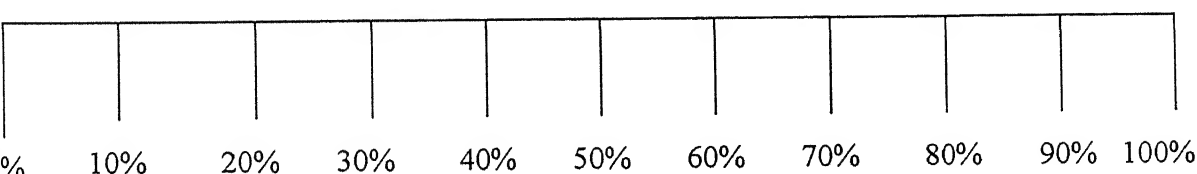
VERTICAL INTEGRATION:-

1. For your major products, please mention the percentage of value added within the company to the final product value-



2. For your major products the cost of assemblies purchased

As percentage of goods sold:-



HUMAN RESOURCES:-

(1). Majority of workers in your organization are. -

(a) unskilled

☐☐

(b) Semi-skilled.

☐☐

(c) Moderate.

☐☐

(d) Multi-skilled.

☐☐

(2) The amount of formal training provided by your firm to employee apart from regular work throughout his tenure is:-

☐☐

(a) Low.

☐☐

(b) Moderate

☐☐

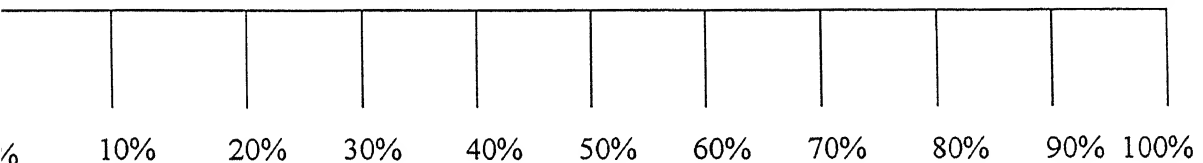
(c) High.

☐☐

(d) Very high

☐☐

(3). Salaries as the percentage of cost of sales-



VENDOR RELATIONS:-

(1). How many vendors for a particular assembly/product are

There in your organization on an average-

(a) 1

☐☐

(b) 2

☐☐

(c) 3

☐☐

(d) 4.

☐☐

(e) >4

☐☐

(2). Your firm will consider vendor relations strategy followed by it as-

(a) Vendors not important so no intended policies as such.

☐☐

(b) Co-operative (i.e. important to joint vendor programs)

☐☐

(c) Competitive (i.e. vendor is selected based on cost, delivery

☐☐

Requirements resultant in frequent change in vendors).

CURRENT AND PAST STATUS OF ORGANIZATION STRUCTURE:

STANDARDIZATION:

Instruction: For the following question write a number between 1 to 7 representing appropriate level in your organization:

(1) What is the frequency of the inspection procedure carried out in your Organization:-

(1-none, 3- haphazard, 5- random sample, 7- 100%)

(2) What is the range of the inspection procedure carried out in your organization -

(1- none, 3- some, 5- all new, 7- all)

(3) What is the methodology of the inspection procedure used in your organization:-

(1- none, 3- visual, 5- attributes, 7- measurements)

(4) What type of the inspection procedure followed in your organization.-

(1- none, 3- one of process, raw material or final inspection,
5- process+final inspection, 7- process+raw material+final inspection)

(5) How frequently is stock taking carried out in your organization.-

(1- never taken, 3- yearly, 3- semiannually, 4- quarterly,
5- monthly, 6- weekly, 7- daily)

(6) How often firm plans made in your organization.-

(1- daily, 2- week, 3-month, 4- quarter, 5- year,
6- over one year, 7- permanent)

(7) How often is scheduling carried out in your organization:-

(1- As needed, 2- monthly, 3- weekly, 5- daily, 7- continuos)

(8) How is the progress checking done in your organization:-

(1- none, 5- irregular, 7- regular)

(9) What is the maintenance procedure in your organization:-

(1- no procedure, 3- breakdown maintenance, 5- mixed,
6- planned maintenance, 7- programmed replacements)

SPECIALIZATION:

Instruction: For the following question write a number between 1 to 7 representing appropriate level in your organization:

- | | | | |
|----|---|----------------------|----------------------|
| 1 | Approximately what percentage of storekeepers are specialized by Product, material or the process in your organization | <input type="text"/> | <input type="text"/> |
| | (1- low, 7- very high) | | |
| 2. | Approximately what percentage of suppliers are specialized by The product or material in your organization | <input type="text"/> | <input type="text"/> |
| | (1- low, 7- very high) | | |
| 3 | Approximately what percentage of stock controllers are specialized By the product, process or the material in your organization | <input type="text"/> | <input type="text"/> |
| | (1- low, 7- very high) | | |
| 4 | To what extent is costing specialized by product or factory in your Organization. | <input type="text"/> | <input type="text"/> |
| | (1- rarely, 7- extensively) | | |
| 5 | To what extent is the machine maintenance specialized by the process In your organization | <input type="text"/> | <input type="text"/> |
| | (1- rarely, 7- mostly) | | |
| 6 | To what extent is the electrical maintenance specialized by the process In your organization | <input type="text"/> | <input type="text"/> |
| | (1- rarely, 7- mostly) | | |
| 7. | Is scheduling specialized by the process in your organization - | <input type="text"/> | <input type="text"/> |
| | (1- never, 7- always) | | |
| 8. | Is the product inspection specialized by stages in your organization:- | <input type="text"/> | <input type="text"/> |
| | (1- never, 7- always) | | |
| 9. | Is the work study specialized by stages in your organization:- | <input type="text"/> | <input type="text"/> |
| | (1- never, 7- always) | | |

INSTRUCTION.

1.	Operating	e g. Direct worker
2	Supervisory	e g. Foreman
3.	Work flow unit	e.g. Plant manager
4.	All workflow activities	e.g. Production manager
5	Whole organization	e.g. Managing director
6.	Above chief executive	e.g. Board of group

For the following questions please respond by filling an appropriate number indicating a particular level as indicated above:

At what level each of the following decisions taken in your organization.

1. labor force requirements:-
2. Appointments of the direct workers:-
- 3 Promotion of the direct workers:-
- 4 Number of supervisors -
5. Promotion of the supervisory staff-..
6. Salaries of the supervisory staff:-
7. Spending of the unbudgeted or unallocated money on the capital items.-
- 8 Spending of the unbudgeted or unallocated money on the revenue items.-
9. Selection of the type or brand of the new equipment:-
10. Overtime to be worked:-.....
11. Delivery dates or the priority of the orders:-
12. New product or service:-
13. Marketing territories to be covered:-

[illegible]

FORMALIZATION:

Instruction:

For the following questions indicate a number in the range of 1 to 7, indicating the level to which documentation of the procedure is employed in your organisation:-

1. To what extent are written instructions available to direct workers:-
(1- rarely available, 7- always available)
2. To what extent are written terms of reference or job descriptions available in your organization:-
(1- rarely available, 7- always available)
3. To what extent are written policies used in your organization:-
(1- rarely used, 7- largely used)
4. To what extent are workflow schedule or programs maintained in your organization:-
(1- rarely maintained, 7- always maintained)
5. To what extent is management approval in written required for certain decisions.-
(1- minimal, 7- absolutely necessary)
6. To what extent are memo forms used in your organization:-
(1- rarely used, 7- largely used)
7. Do you have a minute for senior executive meeting:-
(1- rarely, 7- to a large extent)
8. Do you have an agenda for workflow(production) in your organization:-
(1- rarely, 7- to a large extent)
9. Do you maintain welfare documents for the direct workers on engagements:-
(1- rarely, 7- to a large extent)
10. Does your organization maintain dismissal forms or reports recording or communicating the dismissal .-
(1- rarely, 7- to a large extent)
11. Does your organization maintain records of the inspection performed like quality card.-
(1- rarely, 7- to a large extent)

12. Does your organization maintain record of maintenance performed on workflow
(production) equipment's:-

(1-rarely, 7- to a large extent)

13. Does your organization maintain record of direct worker's work -

(1- rarely, 7- to a large extent)

14 Does your organization maintain record of direct workers time:-

(1- rarely, 7- to a large extent)

COMPLEXITY OF WORKFLOW:-

Instructions: Given below are some of the questions meant to study the structure of your organisation. You are to indicate the extent to which your organisation employ each statement by writing an appropriate number as indicated:-

1. In your organization how frequently are interdepartmental comities set up to allow departments (manufacturing) to engage in joint decision making:-

(1- used rarely, 7- used very frequently)

2 In your organization how frequently are task forces, temporary bodies set up to facilitate interdepartmental collaboration on a specific project.-

(1- used rarely, 7- used very frequently)

2 In your organization is there use of liaison personnel whose specific job is to co-ordinate the efforts of several departments for purpose of a specific project:-

(1- used rarely, 7- used very frequently)

3. In your organization what is the interdepartmental interactions on most decisions:-

(1- each departments makes its decisions on its own,

7- high interdepartmental interactions on most decisions)

APPENDIX-B
LIST OF COMPANIES

1. LOHIA STARLINGER LIMITED.
2. EMA INDIA LIMITED.
3. DUNCANS INDUSTRIES LIMITED.
4. MARUTI UDYOG LIMITED.
5. HERO HONDA MOTERS.
6. FRONTIER SPRINGS.
7. CAWNPORE WOOLEN MILLS
8. INDAL, HIRAKUD.
9. PEPSI-CO.
10. EVERADAY INDUSTRIES LIMITED.
11. IDCOL CEMENTS.
12. UPTRON INDIA LIMITED.
13. KANPUR PLASTIPACK LIMITED.
14. TRACKPARTS LIMITED.
15. TENNARY AND FOOTWEAR LIMITED.